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DEIFIED AS HORUS
IN ANCIENT EGYPT?**

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NOAH'S ARK, ALTAR,
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PROBLEMATIC EVOLUTION OF *Human Skin*

**A WET SAHARA DESERT
AFTER THE ICE AGE**

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An international journal devoted to the presentation and discussion of technical aspects of the sciences such as geology, biology, astronomy, etc., and also geography, archaeology, biblical history, philosophy, etc., as they relate to the study of biblical creation and Noah's Flood.

COVER: People of diverse ethnicity holding hands

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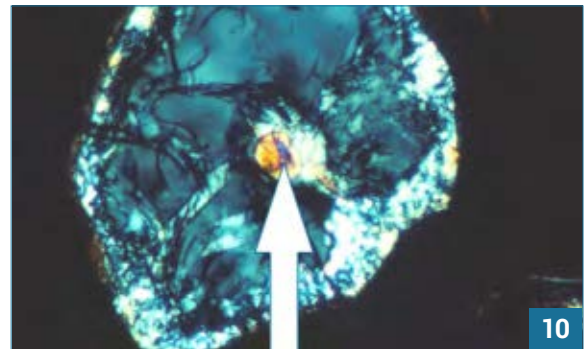
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PERSPECTIVES

- 3** The uniformitarian conundrum of the Mid-Pleistocene Transition
» Michael J. Oard
- 5** Analysis of mtDNA from sediments in Denisova Cave
» Peter Line
- 8** A famous ice age deposit re-interpreted as a product of mass flow
» Michael J. Oard
- 10** Are ultrahigh-pressure minerals caused by climate?
» Michael J. Oard
- 12** The current state of creationist ice core research
» Jake Hebert
- 15** Fossil tree casts in the Columbia River Gorge
» Edward A. Isaacs
- 18** *Scelidosaurus*—evidence of rapid burial in the Early Jurassic of southern England
» Andrew Sibley

LETTERS

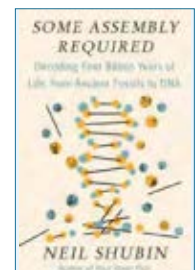
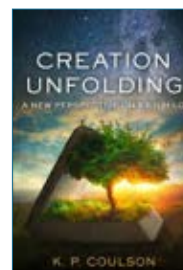
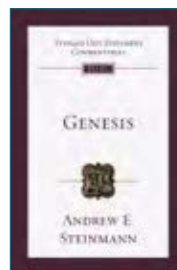
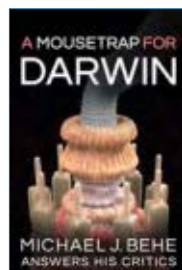
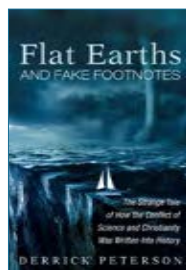
- 20** Hartnett's expanding 5D universe does not solve the starlight travel time problem
» Peter Trüb
» REPLY: John Hartnett
- 21** Did Darwin plagiarize Matthew?
» Mike Sutton
» REPLY: Dominic Statham



Tectonic pressures during the Flood can explain how ultrahigh-pressure minerals formed at shallow depths.

BOOK REVIEWS

- 23** A twisted road: science—religion conflicts
» John Woodmorappe
» *Flat Earths and Fake Footnotes: The strange tale of how the conflict of science and Christianity was written into history* (Derrick Peterson)
- 26** How many ways can one compromise on creation?
» Lita Sanders
» *Original Sin and the Fall: Five views* (Stump, J.B. and Meister, C. (Eds.))
- 29** Irreducible complexity remains a fatal problem for Darwinian evolution
» John Woodmorappe
» *A Mousetrap for Darwin: Michael J. Behe answers his critics* (Michael J. Behe)
- 34** Reliable and accessible commentary
» Andrew S. Kulikovsky
» *Genesis (Tyndale Old Testament Commentaries)* (Andrew E. Steinmann)
- 41** Creation Week, mature creation, and natural processes?
» Shaun Doyle
» *Creation Unfolding: A new perspective on Ex Nihilo* (K.P. Coulson)
- 47** History of biology with unsubstantiated tributes to evolution
» Joel Tay
» *Some Assembly Required: Decoding four billion years of life, from ancient fossils to DNA* (Neil Shubin)



VIEWPOINT

- 50** Candidate site for Noah's Ark, altar, and tomb
» Ken Griffith & Darrell K. White
- 64** Horus—the deified Ham: part 2
» Gavin Cox
- 73** The chronology of the Law and the Prophets as a twofold witness to biblical inerrancy
» Renae Beckman

ESSAYS

- 85** Evolution of the human skin
» Jerry Bergman
- 91** The problematic evolution of mammary glands: milking the 'soured' evidence for all it's worth
» Jerry Bergman

PAPERS

- 97** Ice core oscillations and abrupt climate changes: part 4—abrupt changes better explained by the Ice Age
» Michael J. Oard
- 103** Ice core oscillations and abrupt climate changes: part 5—the early Holocene green Sahara
» Michael J. Oard
- 109** Created kinds vs Ark kinds—implications for creation research
» Jean K. Lightner
- 116** Developments in paleoanthropology
» Peter Line
- 125** Evaluating the origin of salt deposits and salt structures
» Jacob Blom



106

Are prehistoric rock paintings from the Ennedi Mountains in Central Africa a clue to past climate change?



122

Recently described Harbin cranium and Nesher Ramla Homo suggest interbreeding between the different human population subgroups.

ABOUT US

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The uniformitarian conundrum of the Mid-Pleistocene Transition

Michael J. Oard

Uniformitarian scientists are now claiming there were about 50 ice ages of various intensities during the Pleistocene.¹ These are not based on continental glacial debris, which generally show one ice age, but instead are interpreted from deep-sea cores. Uniformitarian scientists measure several variables down the deep-sea cores, including the amount of carbonate and the oxygen isotope ratio that oscillates around an average. When the variables wiggle to one side of the average it is considered a glacial phase, and when it oscillates in the other direction it is considered an interglacial phase. All of these wiggles are in turn interpreted by the astronomical or Milankovitch theory of ice ages.²

The uniformitarian conundrum of the Mid-Pleistocene Transition

Oscillations older than about 900 ka are believed to follow the 41-ka tilt cycle, while younger oscillations are believed to be caused by the 100-ka eccentricity cycle (figure 1). The transition is called the Mid-Pleistocene Transition (MPT). The cause of MPT has been a long-standing mystery for uniformitarian scientists: “Because orbital forcing did not shift at this time, the ultimate cause of this mid-Pleistocene transition remains enigmatic.”³

Many models have been suggested, but none are able to explain the MPT. Models include internal climate amplifiers or feedbacks, ocean circulation changes, and interactions with Earth’s carbon cycle.

A proposed ‘solution’

A new model suggests that the MPT was caused by enhanced deep ocean carbon storage as a result of a reduced Atlantic Meridional Overturning Circulation (AMOC).⁴ AMOC is the circulation in the Atlantic Ocean where warm, salty water in the upper layers of the North Atlantic moves northward, sink, and moves southward as cold deep water to the South Atlantic, where it upwells. Due to the changing strength of the North Atlantic Deep Water and Antarctic Bottom Water, the deep ocean has variable stability to vertical overturning. The changing strength of the upwelling and sinking determines how much carbon builds up or is released. The North Atlantic Deep Water from AMOC is thought to be related to the strength of the circulation.

Based on deep-sea cores, Farmer *et al.* claim by geochemical measurements that at the Mid Pleistocene Transition, AMOC decreased 20% resulting in 50 gigatons greater carbon storage in the deep ocean. This carbon storage is related to carbon dioxide in the upper layers of the ocean that are in equilibrium with atmospheric carbon dioxide. So, more carbon accumulation in the deep ocean results in less atmospheric carbon dioxide. This is thought to cause cooler temperatures, a greater ice volume during the last 9 ice ages, and to increase the periodicity from 41 ka to 100 ka.

Problems with the new ‘solution’

However, the oceanographic and atmospheric connections for this mechanism are global and complex. They depend upon the complex interplay between the carbon cycle, amount of carbon dioxide uptake in the Southern Hemisphere ocean, the assumed temperature change caused by a change in carbon dioxide, changes in Earth’s ice volume and sea ice, amount of iron availability and its relationship to the

biological pump, erosion of continental sediments, variable ocean circulation, the connection between various variables, and various other complexities. Then there is the question: what mechanism would cause reduced atmospheric carbon dioxide for the past 900 ka years to be able to switch from 41 ka climate cycles to 100 ka climate cycles? Supposedly, less carbon dioxide would lead to colder temperatures and more ice buildup, but how significant is this relationship? How could less carbon dioxide cause such a dramatic shift in ice age cyclicity? The deep-sea cores used to determine geochemical variables also have to be accurately dated, which adds another level of assumptions and complexity.

A hint of the complexity of the proposed solution and sketchy relationships between some of the variables is given by Farmer *et al.*:

“The missing glacial [atmospheric carbon dioxide] was most probably sequestered in the deep ocean, as suggested by benthic foraminiferal carbon isotope records ($\delta^{13}\text{C}_b$). However, evidence from $\delta^{13}\text{C}_b$ data reflects a combination of ocean circulation, air-sea gas exchange and ocean carbon content, which complicates quantitative reconstructions of any one parameter. As reliable quantitative records of ocean carbonate chemistry are sparse, how the ocean sequestered additional CO_2 at the MPT is a matter of debate.”³

The glaring problem that the 100-ka cycle has no forcing

Of the many problems with the Milankovitch mechanism, the most significant, currently being ignored, is that the 100-ka cycle changes solar radiation on Earth by extremely little!^{5,6} This periodicity was ‘proven’ by Hays *et al.* in 1976.⁷ However, MIT professor of atmospheric science Carl Wunch equates the eccentricity cycle to chance:

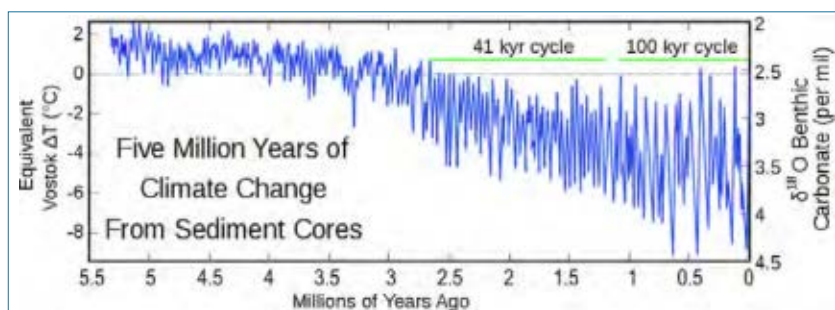


Figure 1. Five million years of climate change history based on the LR04 Benthic Stack (Robert A. Rohde, Wikipedia commons CC-BY-SA-3.0 mitigated). The curve represents oxygen isotope measurements from benthic foraminifera, taken from 57 deep sea cores that were dated by orbital tuning (the Milankovitch theory) and aligned by an automate graphic correlation algorithm. It also shows the oscillations extending back into the early Pliocene. The 50 or so wiggle cycles younger than 2.6 million years old are the basis for the claim of 50 Pleistocene ice ages.

“Evidence cited to support the hypothesis that the 100 Ka glacial/interglacial cycles are controlled by the quasi-periodic insolation [solar] forcing is likely indistinguishable from chance.”⁸

Another problem with the 100-ka cycle is that spectrum analysis of climate gives a sharp 100-ka peak, but the eccentricity follows cycles of 400-ka, 125 ka, and 95 ka.⁹ These frequencies almost never show up.

The Milankovitch bandwagon effect

Ever since 1976, thousands of research papers have been published assuming the Milankovitch mechanism, producing a powerful reinforcement syndrome or bandwagon effect.¹⁰ The Milankovitch mechanism was not only applied to supposed ice age cycles, but also to Cenozoic cycles in sedimentary rocks and even some sedimentary cycles in the Paleozoic.¹¹

The Milankovitch mechanism has become the *ruling paradigm* in climate research and is rapidly assuming that role in ‘high-precision stratigraphic dating’. All climate-related data, as well as dating methods, are made to fit the theory.¹² Scientists even ‘tune’ data sets, such as deep-sea cores, to the cycles by adjusting the sedimentation rate.¹³ This is circular reasoning:

“However, interpreting results based on orbital tuning can lead to circular reasoning, because the presence of an orbital signal is commonly assumed before it is tested. Furthermore, the outcome depends on choosing an appropriate target curve and/or frequency for tuning. As a result, astrochronology may provide multiple unconstrained orbital interpretations for a given stratigraphy.”¹⁴

Jake Hebert of the Institute for Creation Research has recalculated the data and the periodicity of the cycles in the Hays *et al.* paper⁷ by using the new uniformitarian date of the last Earth magnetic polarity change from the Matuyama reversed chron to the Bruhnes normal chron.^{15,16} He discovered that the Milankovitch cycles were *not* produced, and therefore concludes the entire Milankovitch enterprise is a house of cards. Uniformitarian paleo-oceanographers quietly provided an ‘alternate’ justification for the Milankovitch theory in 1997, apparently in response to the charge that they were engaging in circular reasoning.^{16,17} This ‘backup’ confirmation demonstrated inconsistent handling of seafloor sediment data and arguably depended on a biased selection of seafloor sediment cores.¹⁸ That they have apparently never candidly acknowledged this problem with the Brunhes-Matuyama magnetic

reversal to either the larger scientific community or the general public suggests that this alternate ‘proof’ is not entirely convincing, even in their own minds.

To make matters worse, the Milankovitch theory, despite its many weaknesses, is one of the main arguments for catastrophic climate change!¹⁹

Conclusion

The new proposal to explain the cause of the MPT is like so many others: speculative with too many interacting, poorly known variables. All of the precision implied by dating with the Milankovitch mechanism is really based on a flawed ‘proof’. It demonstrates the circular reasoning inherent in much uniformitarian dating and thinking.

The cause of the oscillations in the deep-sea core variables still needs explaining, as does so much other data that comes from the ocean bottom sediments. For the core tops, I believe the oscillations in the variables can be explained by variable dust loading sequences during the gradual decrease in Ice Age volcanicity.²

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Analysis of mtDNA from sediments in Denisova Cave

Peter Line

On 23 June 2021 a study published by Zavala *et al.* reported on the analysis of mitochondrial (mt) DNA from sediment samples collected in Denisova Cave, including 175 samples of ‘ancient hominin’ (Denisovan, Neanderthal, and modern human) mtDNA, said to cover “nearly all layers in all three chambers”.¹ According to the authors, Denisovan mtDNA was found earliest, said to be associated with stone tools of the Middle Palaeolithic, supposedly deposited about 250 to 170 thousand years ago (ka), with Neanderthal mtDNA said to first appear “towards the end of this period.”² Denisovans and Neanderthals are alleged to have occupied the site repeatedly, “possibly until, or after, the onset of the Initial Upper Palaeolithic at least 45,000 years ago, when modern human mtDNA is first recorded in the sediments.”¹

Modern human mtDNA

The authors could not rule out all three human subgroups having been present there during the same time period, referred to as the “period of Initial Upper Palaeolithic production”.³ No modern human fossils have been found at the Denisova Cave site, and so the traces of modern human mtDNA detected are said by Zavala *et al.* to be “the first direct evidence of *Homo sapiens*’ presence at the cave.”⁴ The mtDNA of modern humans was found in the “same layers as the jewellery and pendants made from stone, bone, tooth and ivory”.⁴ The detection

of different Neanderthal lineages, and results reflecting possibly different Denisovan populations,³ make for a complex occupation history.

All members of same species

An overview of the Denisovans was published by me in 2019.⁵ Earlier genome studies have reported evidence that the Denisovans interbred with modern humans⁶ and Neanderthals.⁷ There is also evidence of Neanderthals interbreeding with modern humans.⁸ Hence, by the biological species concept that makes them all part of the same species. Technically, they should all be classified as *Homo sapiens*. From a biblical view, they were all members of the created human *kind*, and hence descendants of Adam and Eve.

If the evolutionary assumptions and long ages are dropped, then a simple explanation is that the Denisovans, Neanderthals, and modern humans all belonged to populations that, to various degrees, interbred with each other. Also, hybridization between subgroups within the same species (e.g. between humans broadly categorized as *Homo erectus*, *Homo heidelbergensis*, *Homo neanderthalensis*, Denisovan, and *Homo sapiens*) can give rise to appearances that are sometimes ‘blended’ in general character, and at other times mosaic, which may explain some of the features observed in the fossil record of humans.

The Zavala *et al.* study reported only on mtDNA, not nuclear DNA, which can complicate matters. For example, consider the Spanish fossil remains from the Sima de los Huesos (SH) site in Sierra de Atapuerca, Burgos, Northern Spain. These remains are usually assigned to the species *Homo heidelbergensis*, as well as being referred to as middle Pleistocene hominins (or hominids). An almost complete mtDNA sequence of an SH specimen was reported in 2014 as “closely related to the lineage leading

to mitochondrial genomes of Denisovans”.⁹ However, when the nuclear DNA was sequenced from two specimens in 2016, it was reported that the SH specimens “were related to Neanderthals rather than to Denisovans”, even though the mtDNA recovered from one of the specimens shared the earlier described relationship to Denisovan mtDNA.¹⁰

A simple explanation in the above case is that the Denisovan, Neanderthal, and SH *Homo heidelbergensis* remains all belonged to populations that were fully human, and, to various degrees, interbred with each other.

In general, the mtDNA results reported from the Denisova Cave present no issue for the creationist model of human origins. However, evolutionists allege that there was an accumulation of a few metres of sediments in the chambers of the Denisova Cave, over hundreds of thousands of years, where the samples of mtDNA were collected.

Denisova Cave

Denisova Cave is in the Altai mountains of Siberia, Russia (figure 1). More specifically, it “is situated in the low and middle mountains of the north-west Altai mountains in the upper Anui Basin.”¹¹ The limestone cave is situated “above the right bank of the Anui River at a point where the valley narrows.”¹² The entrance to the cave is about 28 m above the modern-day river level, with the river surface 662 m above sea level.¹³ There are three chambers (Main, East, and South Chambers) in the Denisova Cave, each containing deposits, as described by Jacobs *et al.*:

“Main Chamber is about 10 m high and contains approximately 6 m of deposits, which were first excavated 40 years ago. East Chamber and South Chamber are both narrow (less than 3 m wide) and extend away from Main Chamber ... ; their deposits have been excavated to depths of about 7 and 4.5

m, respectively. The upper 1.5–2 m of deposit in each chamber (layers 0–8) are Holocene in age. The underlying Pleistocene deposits consist of clay, silt and sand grains (that were blown or washed into the cave, or were reworked from pre-existing cave sediments) interstratified with coarser, angular limestone debris (gravel-size and larger) spalled from the floor, walls and roof of the cave owing to physical and chemical weathering of the bedrock.”¹⁴

On the “complexity and spatial heterogeneity of the deposits” in the three principal chambers, Morley *et al.* commented that it revealed “a stratigraphic sequence created by geological (e.g. physical and chemical weathering, subsidence, and deformation), biological (e.g. animal activity), and anthropogenic (e.g. stone artefact manufacture) processes.”¹⁵ According to Zavala *et al.*, the three chambers of the Denisova Cave:

“... contain deposits with stratigraphic sequences extending from the Middle Pleistocene to the Holocene epoch. The Pleistocene

deposits have chronologies that have been constructed from the radiocarbon dating of bone, tooth and charcoal ... (to around 50 thousand years ago (ka)) and optical dating of sediments ... (to more than 300 ka).”¹²

There appear to have been difficulties in constructing a common timescale for the three chambers. The South Chamber was excluded “because of various stratigraphic complications”, and according to Zavala *et al.*:

“... there is no a priori reason to assume that sediments have accumulated continuously, or at the same rate, in each of the chambers. Time gaps in the stratigraphic sequence may therefore differ between the chambers owing to erosional events or periods of little or no sediment deposition.”¹⁶

Dating of Denisova Cave

From the above, it seems radiocarbon dating (up to about 50 ka) and optical dating (to more than 300 ka) were used to date the sediments and



Figure 1. Denisova Cave, Altai Mountains, Siberia, Russia

Image: Демин Алексей Барнаул/CC BY-SA 4.0

provide a timescale for the deposits. However, the radiocarbon dating method is known to have problems, flawed assumptions, and to be unreliable, as discussed by Snelling.¹⁷ It is also often rejected by evolutionists. For example, in 2017 *Homo naledi* was ‘dated’ to between 236 and 335 ka (using US-ESR and U-Th).¹⁸ However, two *Homo naledi* bone fragments were radiocarbon dated to c. 33.0 ka and 35.5 ka, but the dates were conveniently rejected; the reason given by the authors was that they interpreted “these ages to relate to late calcite precipitation in the bones that may reflect a wet period in the cave.”¹⁹ This illustrates the ambiguity of dating methods.

The optical dating methods used in the Denisova Cave were quartz optically stimulated luminescence (OSL) and K-feldspar post-infrared infrared stimulated luminescence (pIRIR).²⁰ Jacobs *et al.* stated that “Optical dating gives an estimate of the time since grains of minerals, such as quartz and K-feldspar, were last exposed to sunlight.”²⁰ According to the authors the “ages of the older samples were determined solely from the K-feldspar pIRIR signal, owing to saturation of the quartz OSL signal.”²⁰ According to geologist Tasman Walker, thermoluminescence dating and its related techniques, such as OSL and infrared stimulated luminescence (IRSL: note that the pIRIR dating is a modified version of the IRSL dating²¹), have many unknowns:

“There are many unknowns, and many assumptions are needed, including the amount of radiation ‘stored’ in the mineral at a certain time in the past, that the change in radiation has only been affected by the radiation in the environment, that the radiation in the environment has remained constant, and that the sensitivity of the crystal to radiation has not changed with time. All these factors can be affected by water, heat, sunlight, the accumulation or leaching of minerals in

the environment, and many other causes. Once again, the dates are accepted when they are consistent with other information but disregarded when they disagree.”²²

The cave deposits

The ages of the dates obtained for the Denisova Cave deposits, using evolutionary assumptions, are not accepted here. Hence, there is no need to believe the sediments accumulated over hundreds of thousands of years as claimed. From a biblical perspective, the limestone cave would have been formed during the Flood. At the tail end of the Flood, as the waters were receding, sediments would have been left in the cave.^{23,24} Also, towards the end of the post-Flood Ice Age, the Anui River possibly experienced episodes of flooding as the ice thawed in the mountains. Being close to the river, at an elevation of ~28 m above the present-day river level, this could have flooded the cave and left sediments there. It would also have disrupted any human occupation of the site, perhaps explaining why it appears to have changed hands several times between different human subgroups.

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A famous ice age deposit re-interpreted as a product of mass flow

Michael J. Oard

There was a period in the late 1900s in which some uniformitarian scientists came to doubt that most claimed ancient ice age deposits (tillites) were really glacial. Of the four ancient ice age periods, ranging from the late Paleozoic to the early Paleoproterozoic, the Neoproterozoic, 1,000–541 Ma, was the most questioned. Schermerhorn led the challenge.¹ In 1996, a ‘classic Neoproterozoic ‘tillite’ in northern Norway, the Bigganjargga ‘tillite’ with two subparallel striae on bedrock and dropstone varvites, thought to be a diagnostic property of a real glaciation, was reinterpreted as very likely a submarine debris flow.^{2,3} Tillite is considered lithified till, debris left over after glaciation, while dropstone varvites are lithified rocks commonly larger than the thickness of the layers.

Several geologists, especially Rampino, have challenged many tillites as being debris flows from impacts.^{4–6} It is known, but mostly ignored, that mass flows can duplicate all supposed diagnostic features for supposed pre-Pleistocene ice ages.^{7,8}

However, challenges to each of the four main ancient ice ages seem to have been mostly dismissed by uniformitarian geologists.

Snowball Earth

Most of the Neoproterozoic ice age deposits are marine, and, based on paleomagnetism, are thought to come

from the equatorial latitudes. Thus, uniformitarian geologists have been forced to claim the outrageous hypothesis that the earth was totally, or almost totally, glaciated in the Neoproterozoic—about three separate times!^{9–11} Snowball Earth is a radical non-uniformitarian deduction, and the suggested mechanisms for the melting of each global glaciation are even more radical.

The Kingston Peak Formation is reinterpreted as a mass flow deposit

The 3-km-thick Kingston Peak Formation outcrops in numerous small mountain ranges around Death Valley in southeast California. It has been considered a product of one or two ancient Neoproterozoic ice ages,¹² with some of the formation considered glacial while other parts are landslide debris.¹³

“The Kingston Peak Formation has long been viewed by some as a key repository of palaeoenvironmental information on which to base a palaeoclimatic model for

Neoproterozoic ice ages involving global panglacials.”¹⁴

Supposed diagnostic evidence for glaciation included matrix-supported breccia or conglomerate (figure 1), ‘lodgement tillites’, striated rocks, and dropstone varvites. Lodgement till is mostly considered glacial debris laid down below a glacier. Some debrites, the depositional product of a debris flow, were considered reworked glacial deposits downslope from a partially floating ice sheet.

A new analysis of the messy formation shows that all of it consists of a mixture of various mass flow debris, as well as normal sediments, that are fault controlled, likely by earthquake activity.¹⁵

“From the preceding description and interpretations of lithofacies, it is evident that, with the exception of thin limestone horizons and volcanics, all facies of the Kingston Peak Formation are the product of sediment gravity flow [mass movement] processes in deep water well below wave base that were generated relatively proximal to source.



Image: Van Wingerden

Figure 1. Matrix-supported conglomerate from the Kingston Peak Formation is commonly considered a glaciogenic texture but is better interpreted as a mass flow deposit.

The interbedding of olistoliths [heterogenous mixture of large blocks within sediment], debrites and turbidites all indicate the nearby presence of unstable fault scarps that exposed not only [sic] older pre-Kingston Peak Formation and Pah-rump Group strata but also underlying crystalline basement gneisses and granites.”¹⁶

Other Neoproterozoic ‘tillites’ may be non-glacial

The formation was deposited in a rift basin, similar to other such Neoproterozoic deposits in North America and other continents. This suggests these other diamictites are non-glacial: “Already, many classic ‘glacial’ deposits in similar Neoproterozoic succession have been recently confirmed to be debris flows preserved by rapid subsidence in tectonically-active basins on sedimentological grounds, and may be potential candidates for further application of this method.”¹⁷

Conclusions

Several creation scientists have long studied the Kingston Peak Formation and determined that it was a gigantic mass flow deposit.^{18,19} It looks like uniformitarian scientists are catching up.

The new interpretation shows how easily geological misinterpretations are made, especially when one looks at such underwater landslide deposits through the lens of ancient ice ages. It also shows that landslide deposits can duplicate all of the supposed diagnostic properties.

These landslide deposits were very early Flood deposits.¹⁸ It appears many other Neoproterozoic deposits were also deposited as mass flows in rifts. Deep rifting, basin formation, and rapid deposition seems to be characteristic of the very early Flood. I

would also include the Belt Supergroup of western Montana, northern Idaho, extreme northeast Washington, and adjacent Canada as deposits formed in a deep basin that two uniformitarian geologists believe was an impact crater.²⁰ The remarkable North American Midcontinental Rift would also be included in the very early Flood.²¹ The very early Flood was indeed extremely catastrophic.

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Are ultrahigh-pressure minerals caused by climate?

Michael J. Oard

One of the most surprising discoveries in the earth sciences is the finding of ultrahigh-pressure (UHP) minerals, such as coesite (figure 1), stishovite, and garnet peridotite, as well as microdiamonds, on the surface of the earth.¹ These UHP minerals are commonly found in mountains. They are found in small areas as well as extensive areas:

“In Norway and China, rocks containing coesite or diamond crop out over areas of at least 5000 km², and contiguous high-pressure [HP] rocks crop out over areas >20,000–30,000 km².”²

Rocks containing high-pressure (HP) minerals, such as blueschist and eclogite, have been known for a long time and found at hundreds of locations across the earth.³ The HP and UHP minerals in the rocks suggest they experienced the high pressures that are assumed to exist deep in the upper mantle, down to about 20–100 km for HP minerals and about 100–400 km for UHP minerals.⁴ The fact that these rocks are found on the surface of the earth is very difficult for uniformitarian scientists to explain.⁵ I will focus on UHP minerals since their presence is much harder to explain than HP minerals.

Rocks with HP and UHP minerals formed by subduction?

Uniformitarian scientists believe UHP minerals are within continental rocks that were buried deeply and exhumed quickly, so ‘fast’ that the metamorphic grade did not revert to what

it was before. ‘Fast’ according to them is a few cm/yr. They believe that the only possible way such minerals can form is by subduction (i.e. by being thrust deep into the mantle) within the plate tectonics (PT) paradigm. It once was an axiom of plate tectonics that lighter continental rocks could *not* subduct, but the discovery of UHP minerals changed that:

“For most of the following two decades [after the 1960s], conventional wisdom in the geosciences held that Earth’s continental crust does not subduct into the mantle at convergent plate boundaries because continents are much less dense than the underlying mantle. This inference was challenged in dramatic fashion by the discovery of ‘ultrahigh-pressure’ (UHP) mineral assemblages in exposed continental rocks in the western Alps and the Scandinavian Caledonides.”⁶

So, despite a significant density problem, they concluded that continental rocks do indeed subduct. This has been identified at several subduction zones; for instance, the Adriatic microplate is continental crust, which supposedly subducts north under the

western Alps, west under the northern Apennine Mountains, and east under the Dinaric Mountains.⁷ Another example is the northwest African continent, which subducts under the Eurasian plate.⁸

After continental rocks are deeply subducted into the mantle, they need to rapidly rise. Again, this is believed to be somehow related to subduction or continental collision.⁹ Uniformitarian scientists are greatly challenged:

“Almost all metamorphic petrologists have interpreted these [UHP] assemblages as evidence of the subduction of continental rocks deep into the mantle. But this interpretation begs the question of how UHP rocks that are deeply buried are subsequently returned to the surface (exhumed), and for this many possible mechanisms have been proposed.”⁶

All such models that have been developed depend upon convergent zone exhumation:

“Exhumation of these [UHP] rocks to the surface and the processes responsible still remain a matter of debate ... Quantitative insights are provided by thermo-mechanical numerical models ... most of

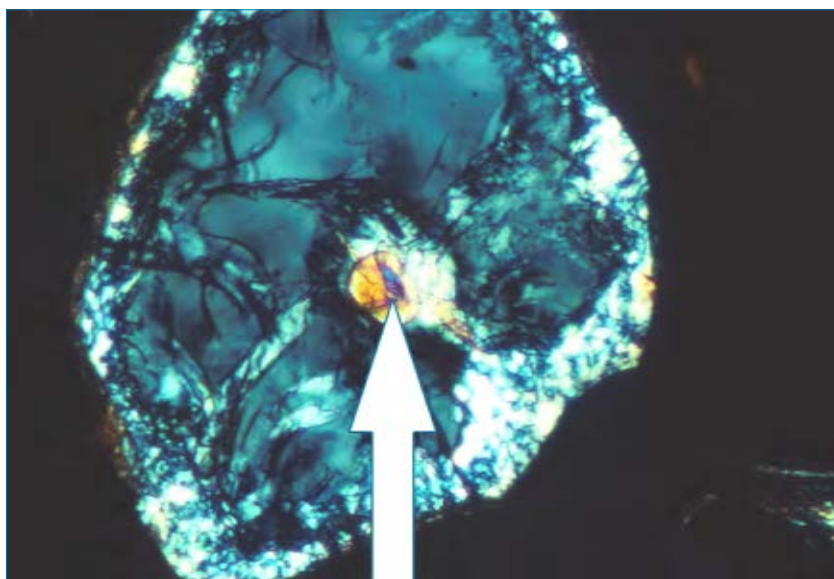


Figure 1. Crossed-polars image of coesite grain (grey) ~1 mm across in eclogite (arrow). Small coloured inclusion is pyroxene surrounded with polycrystalline quartz.

Image: J. Smyth/CC-BY-SA 1.0

which rely on synconvergent exhumation.”¹⁰

‘Synconvergent exhumation’ is the local exhumation of crustal material that occurs at the same time as plate convergence. In this they posit a ‘subduction channel’,¹¹ a layer of mostly sediments from the lower plate that is squeezed between the upper and lower plates during subduction.

Early in the days of PT, it had been assumed that the sediments that overlay the lower plate, being of low density and mostly un lithified, would have been scraped off into ‘accretion prisms’ which became attached to the top of the upper plate. This early PT belief has gone partly to the wayside due to complications at subduction zones, such as some convergent margins that have little accretionary sediments. So, after deep continental subduction and metamorphism to UHP states, the rocks quickly rose to the surface through the ‘subduction channel’ because of their strong positive buoyancy. But some scientists believe this exhumation process is unlikely:

“The comparison of these characteristics with numerical exhumation models suggests that exhumation of (U)HP rocks by buoyancy-driven return flows within a subduction channel under near-lithostatic pressure is unlikely.”¹²

43 locations for UHP minerals supposedly related to climate

To make matters worse, the number of locations with UHP minerals continues to increase. UHP minerals, not including UHP mantle xenoliths, are now found at 43 locations worldwide on all continents, except Australia.⁹ Five UHP terranes are found in the Precambrian, as old as the Paleoproterozoic, ‘dated’ at 1.86 Ga.¹³ Seeking to explain these many finds, some at current high latitudes, Yan and Zhang plotted them according to their ‘paleolatitude’, i.e. the (supposed) latitude they were at when they were

metamorphosed. They discovered that the paleolatitudes were from the tropics and subtropics, 0–30° latitude. The average was 5.1°. Although Yan and Zhang are confident that UHP minerals were caused by subduction, they believe that was ultimately controlled by the climate:

“Our results show that all the UHP rocks exhumed in the orogens were limited to low latitudes, indicating that the UHP exhumation requires particular climatic conditions and seems to be controlled by the climate.”¹⁴

The authors speculate that the connection between climate and exhumation is due to heavy precipitation, rapid erosion, and active faulting. Presumably, heavy erosion causes isostatic uplift that must aid the exhumation of UHP minerals. They also said exhumation occurred during ‘interglacials’ between major ice ages.¹⁵ It is easy to understand why the authors admit that this idea is a subjective argument.

Flood significance

Flood geologists have more options for explaining UHP minerals. The Catastrophic Plate Tectonics model may be able to overcome some of the deficiencies in the uniformitarian PT models.

Further, we also would expect great upward vertical tectonics, but we place it during the Flood, which implies compensatory downward vertical velocity. It is not uncommon to find mantle rocks, such as peridotite, serpentine, and talc, in mountains, for instance in the Pyrenees and Baetic Mountains of Spain.^{16,17} I have found serpentinite from mantle peridotite in the Swauk Formation near Blewett Pass, Washington, and in the mountains of north-central Oregon. Such occurrences indicate that at least upper mantle rocks were exhumed in mountain building. Now UHP rocks indicate that the vertical uplift could be hundreds of kilometres. This poses

the question: was the entire mantle involved in Flood tectonics?

Another variable during the Flood is meteorite impacts. These are known to produce UHP minerals, including microdiamonds.¹⁸ However, the microdiamonds could be different from those formed in UHP terranes.

Faulting was a common occurrence during the Flood. The pressure exerted by these faults added to the lithostatic pressure. Hence this tectonic overpressure could aid in the formation of UHP minerals so the depths of exhumation would not need to be nearly as great.^{19–21} However, some uniformitarian authors think the added pressure is only about 0.5 GPa, or around 10% of the necessary lithostatic pressure.²² However, in a highly catastrophic Flood model, high-pressure faulting, meteorite impacts, powerful volcanism, catastrophic plate tectonics, and rapid differential vertical tectonics would cause much greater tectonic overpressure than uniformitarian scientists propose. Therefore, tectonic overpressures during the Flood likely explain much of how UHP minerals formed at much shallower depths.

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The current state of creationist ice core research

Jake Hebert

Although the ability of the Flood to explain the Ice Age is one of the great strengths of the Creation model,^{1,2} Bible skeptics claim the vast ages assigned to deep Greenland and Antarctic ice cores are insurmountable challenges to the Bible’s 6,000-year chronology.

However, thick ice sheets do *not* need millions of years to form. Uniformitarian glaciologists acknowledge thick ice sheets can form in thousands of years, given sufficiently high ice accumulation rates.^{3,4} Hence, the high Ice Age accumulation rates posited by the Creation Ice Age model can plausibly enable thick ice sheets to have formed in the 4,500 years since the Flood.

Moreover, dating of ice cores is not easy. If annual accumulation rates are high enough, as is the case in central Greenland, visible bands within the ice may be counted directly. However, if accumulation rates are too low, as is the case for the deep cores in East Antarctica, direct counting of layers is not possible,^{5,6} so glaciologists use theoretical age-date models to assign ages to different depths within the ice. These models attempt to take into account thinning of the ice, but without performing the ‘brute force’ calculations discussed below.

These models implicitly assume ‘millions of years’ by taking the height of the ice sheet to be constant or nearly constant.^{7–9} The rationale for this is that any error introduced into the age model by neglecting the thousands of years for the ice sheet’s formation will be negligible compared to the millions of years during which the ice sheet has supposedly been in existence. Hence, the ‘constant height’ assumption implicitly assumes ‘deep time’, and the vast ages assigned to the deep Antarctic cores are unsurprising.

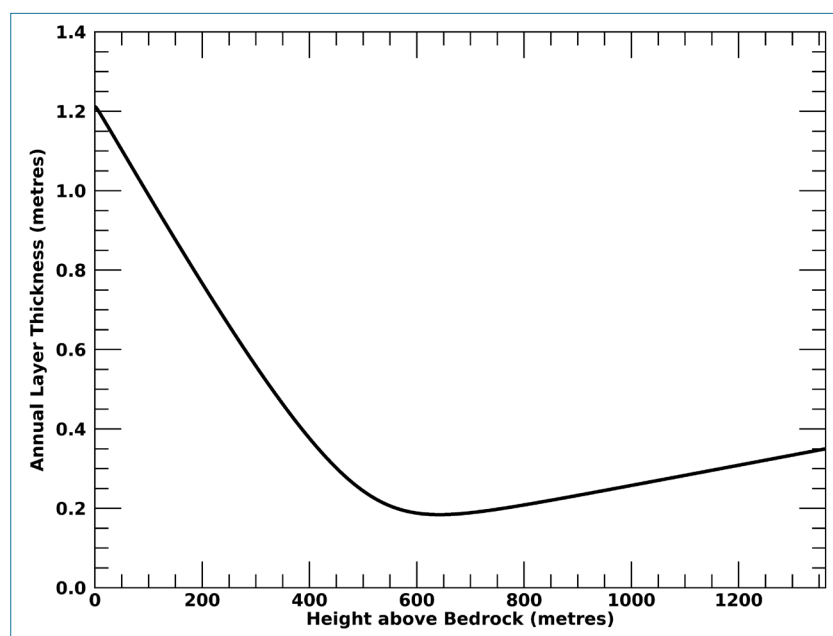


Figure 1. Annual layer thicknesses in the Camp Century, Greenland ice core, calculated using Vardiman’s ice sheet model. After figure 11 in Hebert.²⁷

The ages assigned to the deep Greenland cores *are* obtained by counting of visible ice layers.¹⁰ Hence, some Bible skeptics see the deep Greenland ice cores as unanswerable challenges to biblical creation.¹¹ However, multiple layers are deposited per year, and the number of these layers can vary from year to year.¹² Hence, scientists must make educated guesses about how many visible bands should be grouped together and counted as representing a single year, which is *not* a trivial task. In fact, some glaciology pioneers suggested that counting could yield ages of 10% accuracy or better only for ice less than 200 years old!¹³ Secular glaciologists now think they can count back tens of thousands of years with an accuracy of 10%.¹⁴ This earlier pessimism is more realistic, as demonstrated when uniformitarian glaciologists increased their assigned age for the bottom of the GISP2 core from 85,000 years to 111,000 years simply by increasing the resolution of their dust measurements in the bottom 500 m of the core!¹⁵

Interestingly, in the upper halves of the Greenland ice cores, creationist and uniformitarian age assignments agree to within a factor of two or three of one another.^{16,17} Only in the bottom halves of the Greenland cores do uniformitarian and creationist age estimates dramatically diverge. Yet, the counting process is most difficult and uncertain in the bottom core sections, where ‘jumps’ in dust content are assumed to represent seasonal cycles.¹⁸ However, several factors together can plausibly account for overcounting in the bottoms of the Greenland cores.¹⁷ First, seventyfold variations in dust content in the core bottoms complicate the counting process.¹⁹ Second, individual storms (thousands of which would be expected in a post-Flood Ice Age lasting hundreds of years) can change ice dust content.²⁰ Third, uniformitarian expectations of very thin

annual layers in the bottom core sections contribute to overcounting.¹⁷

Moreover, creationists have pointed out that the frequencies and thicknesses of tephra layers within the deep Antarctic ice cores are more consistent with young-Earth expectations^{21,22} as is the lack of erosion of the Gamburtsev Mountains beneath the East Antarctic ice sheet.^{23–25}

For the above reasons, I think creationists have refuted claims that ice cores demand an old Earth. However, we have done very little actual modelling of the ice sheets. In theory, one can use a physics-based model to simulate the formation and thinning of a thick ice sheet without making the usual ‘old Earth’ assumptions. This is the ideal way to model the growth of an ice sheet: finding the stresses (forces per unit area) on parcels within the ice to directly determine how much thinning has occurred. Uniformitarians would likely never attempt to

simulate the entire multi-million year assumed history of an ice sheet with a physics-based computer model, due to the enormously high computational demands. However, creationists could conceivably use such models to simulate the relatively short history of an ice sheet in the creation model.

In 1993 Larry Vardiman of the Institute for Creation Research published a one-dimensional mathematical model for the rapid formation of an ice sheet in the time since the Genesis Flood.²⁶ This model assumed high Ice Age accumulation rates that exponentially decayed to today’s ‘slow and gradual’ rates. This model did not directly calculate the stresses on a parcel of ice but implicitly assumed that thinning of the ice at any time was proportional to the current thickness of the ice sheet.

More recently I used Vardiman’s model and a simple computer code to numerically calculate the thicknesses

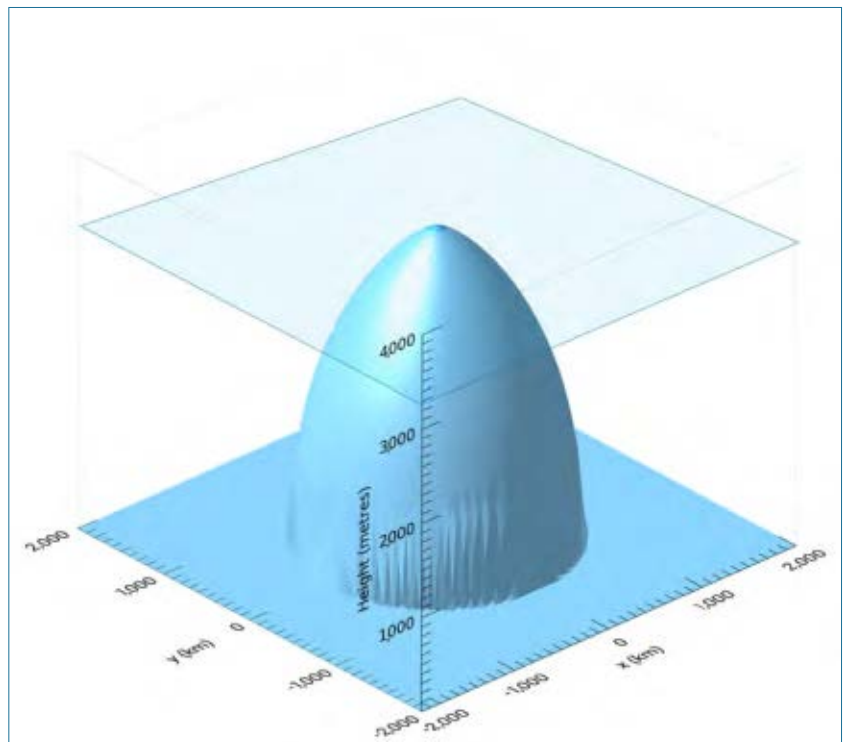


Figure 2. A 3,278-m-tall ice dome ‘grown’ in 4,500 simulated years using the Mahaffy ice flow model and Vardiman’s ice accumulation model. Image courtesy of Jake Hebert and the Institute for Creation Research.

of annual layers within Vardiman's model,²⁷ as shown in figure 1. One interesting result is that in creation-based ice models the thinnest annual layers are not necessarily found at the very bottom of the ice, but can occur at intermediate depths.

However, there is a need for more sophisticated, physics-based creation ice sheet models. All such models simplify the mathematics using the fact that the height of the ice sheet is very thin compared to its horizontal dimensions (the 'shallow ice approximation').

One such model is the Mahaffy model, used to create figure 2.²⁸ I have submitted a paper describing the model for publication. One of the weaknesses of the model is that it does not take into account spatial variations in the temperature of the ice. Moreover, the physics is oversimplified in that certain stresses are ignored in order to make the mathematics tractable.

A more sophisticated 'higher order' model is the Blatter–Pattyn model,^{29,30} utilized by the Community Ice Sheet Model (CISM).³¹ This CISM computer model is freely available to the general public, although implementation of this model may be difficult for those unfamiliar with it. I am currently working on using the Blatter–Pattyn model in some simple two-dimensional problems.

The ability of the creation model to explain the Ice Age and its associated mysteries is one of its great strengths. Nevertheless, creation researchers have some 'catching up' to do when it comes to computer modelling of ice sheets, and we are working to that end.

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Fossil tree casts in the Columbia River Gorge

Edward A. Isaacs

Ranging from volcanism to mass extinctions, flood basalts have stirred much geologic debate, but none as much as the Columbia River Basalts (CRB). Found across four states in northwest United States, the CRB extends across 210,000 km². It comprises over 350 individual flows with an estimated volume exceeding 210,000 km³,¹ over nine times the volume of the US Great Lakes.² Though the smallest of all known continental flood basalt provinces, its preservation and relatively easy accessibility has led to intense study of the CRB for over a century. Critics have used the CRB to challenge the Genesis Flood based on a supposed subaerial origin of the flows. This has led creation researchers to debate the meaning of the CRB to diluvial geology.³ Though controversy continues, tree casts in a flow of the CRB in the Columbia River Gorge indicate that not all may be as it seems.

Columbia River Basalts: stratigraphy, petrology, and paleoenvironment

Primarily tholeiitic (subalkaline), the CRB is a series of over 350 basalt flows originating from feeder dikes along the borders of Washington, Oregon, and Idaho and extends south into Nevada and west to the Pacific Ocean. Secular ages for the CRB are between 16.7 and 5.5 Ma.¹ Eruptions began in south-eastern Oregon with the Steens Basalt (16.8–16.6 Ma) that flowed into

Nevada. However, the later eruptions of Grande Ronde, Wanapum, and Saddle Mountains basalts spread across eastern Washington and Oregon and flowed to the Pacific Ocean. Though occurring over an alleged 11 Ma span, over 95% of the flows are believed to have erupted within a single million years.⁴

As one of the best-defined stratigraphic units in the region, the CRB holds important keys to unlocking the geologic history of the Northwest United States. However, the paleoenvironmental setting remains hotly debated, partially due to the controversial relationship between the CRB and Cascade Range. Early researchers such as Bretz⁵ argued that conglomerate interbeds of the CRB were upwarped during the Cascade Orogeny about 3 Ma ago. This was followed by Newcomb,⁶ who supported Bretz's hypothesis based on mapping of the east-west "Dalles-Umatilla Syncline", south of the Columbia River Gorge. In contrast, Tolan and Beeson hypothesized that, rather than predating the Cascade Range, the CRB reached the Pacific Ocean by flowing along the ancestral Columbia River through the Columbia transarc lowland. They concluded:

"The Priest Rapids Member (Wanapum Basalt) and the Pomona

Member (Saddle Mountains Basalt) of the Columbia River Basalt Group both crossed the Miocene Cascade Range into western Oregon and Washington via ancestral Columbia River channels ... Our work tentatively suggests that the onset of Cascadian uplift in northern Oregon and southern Washington and the incision of the [modern] Columbia River Gorge may have begun as late as 2 m.y. ago."⁷

Radioisotope dating of intrusives near Mount St Helens by Evarts *et al.*⁸ supported folding between 20–15 Ma. However, Cheney contended that folding did not commence until after the CRB eruptions had ceased (4 Ma). This produced a series of anticlinoria comprising current mountain belts including the Cascade Range.⁹ Instead, Cheney argued that the slight non-horizontality of flows along the alleged paleocanyon was a "structural accident" that "defines a westerly striking syncline between anticlinal uplifts of the CRBG [Columbia River Basalt Group] in the Washington Cascades to the north and the Oregon Cascades to the south."¹⁰

Mitchell and Montgomery proposed a compromise between these warring hypotheses. They postulated the Northern Washington Cascades were uplifted before the CRB, while the Southern Washington Cascades



Figure 1. A. Exterior of fossil tree cast exposed in a lower Frenchman Springs (Wanapum) basalt flow at Coyote Wall, Washington, west of Rowena Gap. Note hackly texture of flow except along the periphery of the cast, which is composed of a veneer of pillow basalts. **B.** Interior view of pillow basalt veneer within the tree cast. Prominent pillow in foreground is nearly 10 cm across.

were uplifted following the CRB.¹¹ However, this does not resolve the conflicting radioisotope dates. Indeed, Mitchell and Montgomery

“... did not address the anomalous features that reside wholly within the Southern Washington Cascade Range, which cumulatively necessitate uplift either between 20–15 Ma or approximately 4 Ma. Such a multi-million-year disparity is unusual, considering that naturalistic geologists opine to be capable of dating geologic events with a resolution of one hundred-thousand years!”¹²

Subaerial or subaqueous?

Due to the continental origin of the CRB, secular geologists claim that the flows were emplaced subaerially except where flows entered isolated shallow lakes, ancestral Columbia River, or finally the Pacific Ocean. As such, some have criticized the notion of a global Flood because of the alleged lack of evidence supporting a subaqueous emplacement of the CRB. This has led to debate among creation researchers on its significance

to diluvial geology. Early work by Austin interpreted the John Day volcanics, and thus the younger CRB, as post-Flood.¹³ Garner advocated this in his summary of the secular literature on a subaerial origin of the CRB and similar continental flood basalts.¹⁴ This was contested by Coffin’s study cataloguing features compatible with a subaqueous origin during the Genesis Flood.¹⁵ Subsequent research by Woodmorappe and Oard challenged the secular criteria for determining a subaerial, rather than subaqueous, origin.¹⁶ Since these early studies, the placement of the CRB outpourings has largely depended upon the author’s view of the Geologic Column and the Genesis Flood. This has led to a deductive, rather than field-based, approach to the CRB’s history.

Tree casts west of Rowena Gap

Opening along Rowena Gap near Hood River, Oregon, the Columbia River Gorge reveals a sequence of Grande Ronde, Wanapum, and Pomona flows exposed along a series of folds. Many have been incised to reveal the internal structure.¹⁷ One

such place is Coyote Wall, which is a sheer cliff exposing upper Grande Ronde and lower Frenchman Springs (Wanapum) flows along the Bingen Anticline. This lower Frenchman Springs flow is largely columnar and “commonly hackly jointed, which gives it the outward appearance of a Grande Ronde flow”.¹⁸ Unlike the Grande Ronde in this area, however, the lowest Frenchman Springs flow contains a number of linear casts (figure 1). Up to a few metres tall and 2 m in diameter, these voids are lined by rectangular positive impressions common in tree casts, such as those of Mount St Helens’ Cave Basalt (figure 2). The interior of the casts consists of palagonite and pillow basalts, which surround the casts as much as 1 m beyond. The casts themselves are often several metres above the base of the flow.

The occurrence of pillow basalts indicates that the flow interacted with water, but such pillows are unexpected by the secular framework. The Grande Ronde, Wanapum, and Pomona flows have been interpreted as intra-canyon. However, only isolated shallow lakes would have existed during the repeated Grande Ronde and Frenchman Springs (Wanapum) eruptions until the Columbia River was re-established during the later Pomona flows.¹ This leaves little water, in the secular interpretation, for the flows to interact with.

Though unexpected within the secular paradigm, the association of pillow basalts and palagonites with the tree casts indicate that the flow interacted with water. However, neither a shallow lake nor the ancestral Columbia River may be invoked because the pillow basalts are restricted to within 1 m of the casts. After all, they are found several metres above the base of the flow. If the flow had entered a small body of water and encased trees, the flow would have locally been dominated by pillow basalts around tree casts along the flow’s base. Instead, the hackly jointing of the flow is



Figure 2. A. The rectangular positive impressions visible in the pillow basalt veneer of the interior fossil tree casts resemble those found in documented tree casts of Mount St Helens’ Cave Basalt (**B**).

remarkably consistent for many kilometres along the flow. Furthermore, the contact is remarkably flat, which would leave no place for a small, isolated pool. This indicates that, rather than locally entering a small body of water, the entire flow must have been submerged, resulting in such consistency of jointing except within 1 m of the tree casts. This begs the question: if such consistency can be produced subaqueously with the only exception being around tree casts, how many similar flows have yet to be recognized for subaqueous emplacement? As experiments continue to demonstrate that subaerial and subaqueous environments can produce many features in common,^{19,20} a re-evaluation of CRB stratigraphy is required.

Explainable only by the Genesis Flood

The presence of tree casts associated with pillow basalts and palagonite offers insight into the biblical history of the CRB. Since Garner,¹³ advocates of a post-Flood subaerial CRB have largely adopted the secular model within a compressed timeline, leading a post-Flood interpretation to predict similar paleoenvironmental conditions. Because the CRB was produced before any glaciations, the post-Flood CRB model would have only a few centuries before the post-Flood Ice Age. This would leave little time between successive eruptions to establish isolated pools or shallow rivers along *flat contacts* over such a broad area for the flows to interact with. Instead, what is required is submergence of the CRB, which could only have been accomplished during the Genesis Flood.

Conclusions

Though the most well-studied continental flood basalt province on Earth, the Columbia River Basalts (CRB) continue to stir controversy.

Despite heated disagreement on the CRB's tectonic relation to the Cascade Range, secular geologists remain committed to a subaerial origin, allegedly refuting the Genesis Flood. Faced with this challenge, diluvial geologists have grappled with Flood and post-Flood arguments based on the occasional pillow basalt horizon or extensive jointing characteristic of subaerial emplacement, respectively. However, tree casts in the lowest Frenchman Springs member in the Columbia River Gorge show not all is as it seems. Though unexpected by the secular model, the tree casts reveal a veneer of pillow basalts and palagonites extending as much as 1 m from the interior rim of the casts. Because pillow basalts are associated only with the casts, which themselves are found several metres above the flow's base, a shallow water body environment cannot explain the otherwise consistent hackly jointing. Rather than entering a lake or river, the flow must have been completely submerged beneath water for many kilometres. This is consistent with a Genesis Flood origin but challenges both secular and post-Flood subaerial paleoenvironments.

Acknowledgments

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Scelidosaurus —evidence of rapid burial in the Early Jurassic of southern England

Andrew Sibley

Over the years a number of specimens of the land-living dinosaur *Scelidosaurus* have been found along the Jurassic coast between Charmouth and Lyme Regis in the Black Ven cliffs of the Charmouth Mudstone Formation. This is identified as the Lower Lias, or Early Jurassic, and dated according to the standard uniformitarian timescale to around 190 Ma. The Jurassic coast is normally noted for its marine fossils, but the strata contain fossils of land-living plants and animals, such as wood and flies, mixed with marine ammonites in the same layers. *Scelidosaurus* was a quadrupedal herbivorous dinosaur with the front limbs somewhat shorter than the hind limbs. It was an ornithischian dinosaur, meaning ‘bird-hipped’. It is noteworthy that palaeontologists do not believe birds evolved from bird-hipped dinosaurs, but from theropod saurischian dinosaurs; that is ‘lizard-hipped’ dinosaurs. Protective bony scutes, or osteoderms, have been found on the side and back in rows, which provided some armour for the animal when alive in similar fashion to the osteoderms on crocodiles (unlike *Scelidosaurus*, crocodiles are carnivorous and saurischian). The

animal was typically about 3–4 m long (figure 1).

Scelidosaurus finds

James Harrison found the first specimen in 1858, which included a skull and a few bones (figure 2). It was discovered as a result of quarrying activity at Black Ven, and was sent to Richard Owen who named it *Scelidosaurus harrisonii* in 1859. The more complete skeleton was recovered over subsequent months, with scattered osteoderms present, but seemingly missing the forelimbs. These finds were carefully described in a couple of papers: of the skull and a few bones in 1861, followed by the description of the more complete specimen in 1863.^{1,2} Owen suggested the animal had lived on land, or on the margins of a river. Furthermore, he speculated that the carcass was then washed downstream into the ocean where the body experienced some limited decomposition and scavenging before burial in the mud.² The remains have subsequently been subject to geological compression in the strata. The find has been ascribed to the Woodstone Nodule Bed, part of Black Ven Marls, which is dated to the late Sinemurian marine deposits (between 199.3 ± 2 Ma and 190.8 ± 1.5 Ma).³

Other specimens have subsequently been found in the area around Lyme Regis and Charmouth (and in northern Arizona). Another find was described in 1959 from the same immediate locality near Charmouth; found by James Jackson in the Stonebarrow Marl or Belemnite Marls (early Pliensbachian), which is immediately above the finds described by Owen.⁴ Other specimens of *Scelidosaurus* have been found over the years, including with the remains of skin impressions, for example as discovered in 1985.^{5,6} At least two specimens of *Scelidosaurus* are considered to have been found in these early Pliensbachian strata: dated to between 190.8 ± 1.5 Ma and 182.7 ± 1.5 Ma.^{3,5}

Dinosaur detectives

What is of further relevance for creation scientists is that *Scelidosaurus*’ specimens have been found with stomach contents present and skin impressions left.⁷ Evidence of the preservation of soft tissues in the fossils further supports the necessity for rapid burial in the marine sediment, which is consistent with a global flood. In the UK, a Channel 4 television program, *Dinosaur Detectives* was shown on the 30 December 2004, and carefully described the implications of these



Figure 1. Moulded sculpture of *Scelidosaurus*, displayed in the Lyme Regis Museum, England (photo by author)

finds in terms of the requirement for rapid burial on account of the evidence.⁸

The program reported on the find of a 3.5m long *Scelidosaurus* fossil found within the Lower Jurassic rock layers near Lyme Regis in Dorset by a local fossil hunter David Sole in November 2000, and commented on other recent finds.³ In the program the skin impressions of the 1985 find were likened to those of a crocodile on account of the pattern and osteoderms. The remains found in 2000 did not appear to have evidence of skin, but the specimen did show an almost complete skeleton with articulated bones, and even showing fossilized vegetable matter within its stomach. Using X-ray scanners, they were able to show that the tail vertebrae were insufficient for the animal to have been a strong swimmer, which confirmed the belief that *Scelidosaurus* was a terrestrial dinosaur. The program further discussed the presence of fossilized wood on the beach, which indicates the type of plants the animal may have consumed.

The main detective work of the C4 program was to consider how a terrestrial dinosaur might have become buried rapidly within marine sediment. Several ideas were put forward, but the hypothesis considered most feasible followed along the lines of Owen's proposal. It was proposed that a family of these dinosaurs had been washed out to sea in a giant monsoon flood,

and then buried rapidly in the sediment to preserve some of the incredible detail found, such as stomach contents and skin imprints. But inconsistently, natural scientists continue to date the layers in which the fossils were buried according to uniformitarian principles.

Summary

Scientific researchers have made good progress in their detective work in recognizing that these terrestrial dinosaurs were caught in a flood—their comment is that they must have been washed out to sea in a megamonsoon, and then buried quickly in the thick marine sediment for good preservation to occur. This is similar to Owen's conclusion. However, paleontologists continue to date the specimen according to uniformitarian principles, which is effectively based upon the assumption of gradual deposition.⁹

There would seem to be flawed logic in this approach: if it is necessary to use neo-catastrophism in order to account for the evidence, then uniformitarian assumptions utilized to date the layers in which they are found are no longer applicable. To assert in one breath that fossil specimens must have been buried rapidly because of the evidence, and then to date the strata in which they are buried with the assumption of gradual deposition, is inconsistent. Furthermore, it stretches credulity to believe that specimens found in the same geographic locality can be ascribed to two different periods (early Pliensbachian and late Sinemurian), which are believed to be separated by thousands or even hundreds of thousands of years. The evidence from the fossils is increasingly pointing to rapid burial through multiple layers, which should force a re-evaluation of the applied dating methods and techniques.

A more logical conclusion that can be reached is that the Jurassic coast layers (and we believe most other

layers too) were deposited within a relatively short period of time, and that such a major catastrophe is consistent with the historically recorded Noahic flood.

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9. Geologists generally hold to actualism, not strict uniformitarianism, which allows for flood events of an order of magnitude known from recorded secular history, but this distinction doesn't seem to have changed dating assumptions.



Figure 2. Lithograph of the skull of *Scelidosaurus harrisonii*, from Owen's Monograph 1861.²

Hartnett's expanding 5D universe does not solve the starlight travel time problem

In his popular book *Starlight, Time and New Physics*¹ and the paper “A 5D spherically symmetric expanding universe is young”,² published in this journal, John Hartnett suggests that the light of the most distant galaxies can reach Earth within days as measured by clocks on Earth. His theory is based on a five-dimensional cosmology developed by Moshe Carmeli,³ coupled with an accelerated expansion during the Creation Week. Hartnett argues that during this episode the clocks on Earth ticked much slower than clocks attached to distant galaxies, which move away from Earth according to the Hubble law. However, in this letter I show that Carmeli's theory does not allow for such a time dilation to occur.

The amount of time dilation is to be inferred from the five-dimensional line element of Carmeli's theory. Neglecting gravity, it is given by $ds^2 = \tau^2 dv^2 - dr^2 + c^2 dt^2$, with $\tau = H_0^{-1}$, the inverse of the Hubble constant.⁴ Hartnett now considers an inertial clock, co-moving with a distant galaxy in an expanding universe. As he writes,⁵ such a clock is subject to the Hubble law $v = H_0 r$. In the rest frame of the galaxy, the line element reduces to $ds^2 = c^2 dT^2$ with T the proper time of the clock. In the rest frame of the Earth, dv and dr do not vanish. However, since the clock respects the Hubble law, we have $dv = H_0 dr = \tau^{-1} dr$, and the two first terms in the line element cancel. Therefore, $ds^2 = c^2 dt^2$, with t the proper time on Earth. Since ds is supposed to be equal in all

frames of reference, it follows that $dT = dt$ (contra Hartnett).

Does the situation change when taking gravity into account? In this case, the line element is given by $ds^2 = \tau^2 dv^2 - (1 + (1 - \Omega)r^2/c^2\tau^2)^{-1} dr^2 + c^2 dt^2$, with Ω the mass/energy density of the universe.⁶ The Hubble law changes accordingly to $dr/dv = \tau(1 + (1 - \Omega)r^2/c^2\tau^2)^{-1/2}$.⁷ Therefore, the first and the second term in the line element sum again to zero for galaxies subject to the Hubble law. Therefore, $dT = dt$ as in the case without gravity. Interestingly, Hartnett agrees that “clocks, co-moving with the galaxies in the Hubble expansion, would measure the same proper time”.⁸ If Hartnett would be consequent, he would therefore have to conclude that clocks on Earth tick at the same rate as cosmic clocks.

How then does Hartnett arrive at the wrong conclusion that time dilation could have occurred during the Creation Week? The reason is that in the corresponding sections he erroneously treats v and r as independent variables. At first, he assumes that the motion of the galaxy through space is negligible ($dr/dt \rightarrow 0$)⁹ and neglects the corresponding terms in his subsequent calculations. Shortly afterwards, he inconsistently postulates that $dv/dt \gg c/\tau$,⁹ ignoring that this is incompatible with his earlier assumption because, for comoving clocks, velocity and distance are related by the Hubble law. In other words, it is not possible that the following three conditions obtain at the same time: dr/dt is small; dv/dt is large; the clock is co-moving. The first two conditions could only be met by violating the last condition, for instance by a rapid oscillation of the clock. However, there is no physical reason and no experimental evidence for galaxies to oscillate in such a way. Correctly, Hartnett would have to keep terms with dr/dt , which would later cancel the corresponding terms proportional to dv/dt . Curiously, just before the erroneous paragraph, Hartnett admits

that $dr/dt \rightarrow 0$ implies $dv/dt \rightarrow 0$ but neglects this right afterwards.¹⁰

In conclusion, comoving clocks subject to the Hubble flow tick at the same rate in Carmeli's 5D cosmology. Therefore, no time dilation would have occurred during an accelerated expansion during the Creation Week and Hartnett's model consequently does not solve the starlight travel time problem.

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» John Hartnett replies:

I agree mostly with the arguments presented by the author of this letter. There are some minor details and assumptions I might disagree with but that is now moot as I have already abandoned the Carmeli model for similar reasons to those cited.

I admitted this in November of 2016. I had by that time essentially given up looking for an answer there (see bible.scienceforum.com/2016/11/19/my-use-of-carmelis-cosmology-a-valid-solution/).

Using the Cosmological Special Relativity (CSR) approach (either 4D or 5D), i.e. no gravity, one discovers

inconsistencies which were never resolved. As a result, I made several assumptions in that paper that I now recognise as unjustifiable. The problem really is that Carmeli's time and velocity coordinates in any 5D theory are not independent and the inconsistencies flow from there.

In fact, Carmeli's 4D CSR theory of only space and velocity is inconsistent with his 4D general theory Cosmological General Relativity (CGR), i.e. after he added in gravity. And Carmeli never developed a full general theory of space, time, and velocity which includes gravity. I also found other problems with Carmeli's theory when he attempted to apply it to a 5D universe. None of those were ever resolved.

I have moved on and now think that the very best hope for a biblical creationist model of the universe and the starlight and time question is one involving the *conventionality thesis*. See for example dl0.creation.com/articles/p130/c13061/j33_3_115-121.pdf and dl0.creation.com/articles/p130/c13059/j33_1_71-77.pdf.

The conventionality thesis and the one-way speed of light is God's gift to biblical creationists. Even the atheists acknowledge its validity.

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Did Darwin plagiarize Matthew?

I would like to thank Dominic Statham for authoring an excellent article on Darwin's plagiarism of the theory of evolution by natural selection. His article 'Did Darwin plagiarize Matthew?' was published as an essay in *J. Creation* 29(2):119–123, 2015.¹

Dominic's article is about the evidence for Charles Darwin's (1858/59) plagiarism of Patrick Matthew's (1831) prior published theory.

Matthew (1831) originally coined the term 'natural process of selection' and published it as a theory of organic evolution. Darwin (1859) four-word shuffled Matthew's name for his theory to re-coin it as the 'process of natural selection', with no reference to Matthew's prior published book containing the entire complex theory he replicated.

Dominic's 2015 article on page 121 does cite my 2014 e-book on this topic: 'Nullius in Verba: Darwin's greatest secret',² and he cites several of my original research findings therein. However, earlier in his article, he uses several of my original research findings without attributing them to their prior-published source.

The purpose of this letter is to address the wrongful impression given that data from the historic publication record, taken from my original research,² is long-known common knowledge, or else, that it should be attributed to Dominic Statham.

Prior to my research and its 2014 publication, the only person known to have cited Matthew's (1831) pre-1858 was John Loudon. And that is something the Darwin Industry has pretty much kept under wraps for over 160 years.

My original research, using the IDD method³ led to the publication of two unique lists of entirely new research data in my 2014 book. List 1—all those newly and most importantly

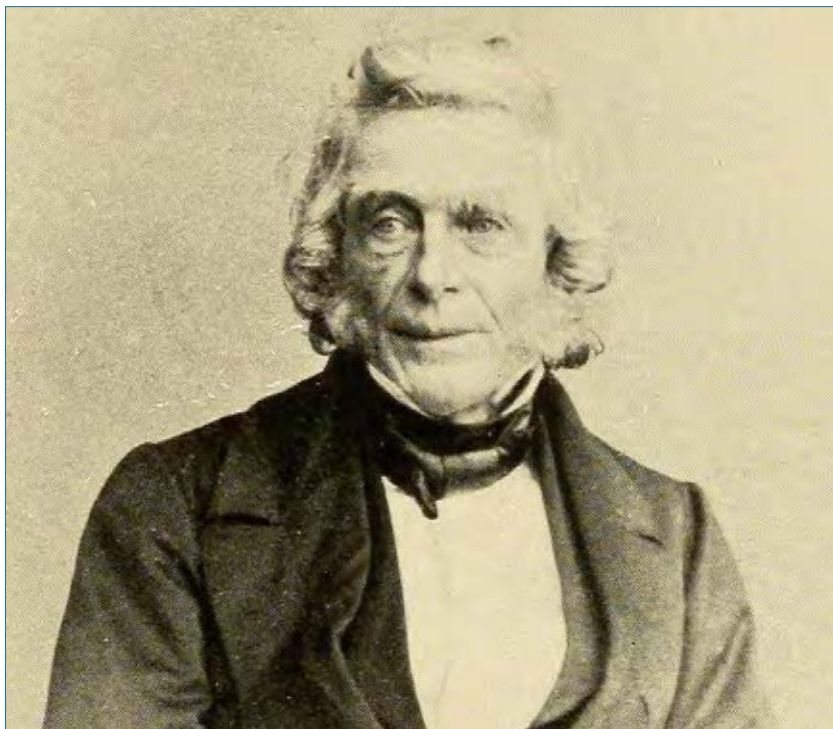


Fig. 1. Patrick Matthew (1790–1874)

originally discovered by the big Data IDD method in my 2013/14 research to have cited Matthew's 1831 book pre-1858; and list 2— all those who were apparently first to go into published print with apparently unique phrases or terms from Matthew's 1831 book, *On Naval Timber and Arboriculture*.⁴

My original research findings used by Dominic but not attributed to my prior published source² are as follows:

1. On page 120 of his article, without citing my book as the original source, Dominic cites David Low (my list 2) as replicating Matthew's apparently original phrase "long continued selection".
2. On page 121, Dominic cites Prideaux John Selby (my list 1).²
3. On page 121, Dominic cites Cuthbert Johnson (my list 1).²
4. My book² is the first publication to reveal that Selby edited the journal that published Wallace's Sarawak paper. On page 121, Statham fails to attribute that fact to my original research.
5. My book² is the first publication to reveal that Matthew's 1831 book was advertised in the 1842 *Encyclopaedia Britannica*. On page 121, Statham fails to attribute that original finding to my research.

Do the above five examples constitute research plagiarism?

The University of Oxford (2020) provides us with arguably the world's most famous definition of what constitutes plagiarism:

"Plagiarism is presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition."

Citation plagiarism of the kind that has occurred in Dominic's article may occur through careless attitudes towards citation,⁵ or it may occur

through an act of what Allen⁶ calls 'blatant plagiarism', which is done with an aim to steal the research finding to deceive others by taking credit for it. I have no reason not to afford Dominic Statham the benefit of the doubt and to presume the former applies in this case.

However, the issue is serious because the data plagiarised was found with a new method.³ Plagiarising a research finding can also constitute 'research method plagiarism' if the method used to make that finding is original. This is because if that original method made the original finding the plagiarist will also, by default, most certainly, in effect, plagiarise the method used to find it.

If *J. Creation* would like me to write for it a more detailed account of the story of Darwin's plagiarism and his proven lies about Matthew's prior-readership I would be more than happy to do so, since Darwin's and Wallace's plagiarism of Matthew's prior published theory is most certainly the world's biggest science fraud. And there are long-neglected issues about 'God mocking', belief in 'The Creator', and even 'Intelligent Design' in the writings of Darwin and Matthew that your readers will, I am sure, be interested to know about.

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» Dominic Statham replies:

Firstly, I would like to thank Dr Mike Sutton for his courteous letter and do hope that my reply will resolve matters satisfactorily. I have every reason to accept his claim to priority in respect of his points 1–5.

Secondly, I wish to commend him for his undoubted contribution to the debate as to whether Charles Darwin did plagiarise Patrick Matthew. Such is the importance of Mike's book, I cited it three times in the main text of my article and another six times in the endnotes. In fact, I felt so indebted to him that, before the article was published, I sent him a copy with a note to the effect that I hoped that he would feel I had adequately acknowledged his work. I recall that he sent me a polite reply with no suggestion that I had plagiarised him.

My article explicitly credits Mike for the IDD method and, in references 38 and 39, the information in his lists 1 and 2. For example, in column 2 of p. 121, I wrote: "Sutton demonstrated that Patrick Matthew was the first to coin the phrases ... 'long continued selection.'" Then, two sentences later, "Low referred to 'long continued selection'", citing reference 39 as my source (i.e. Mike's book). My reference to the advertisement in the 1842 edition of *Encyclopaedia Britannica* appears in the last paragraph of column 1 of p. 121, at the end of which is a reference to Mike's book.

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A twisted road: science–religion conflicts

Flat Earths and Fake Footnotes: The strange tale of how the conflict of science and Christianity was written into history

Derrick Peterson

Cascade Books, Eugene, OR, 2021

John Woodmorappe

The author is an adjunct professor at Multnomah University and Seminary, and a Ph.D. candidate in history. He is also a freelance writer.

Right from the start, author Derrick Peterson comes out and states that the conflict between science and religion has been greatly exaggerated. In fact, he sees it as largely a set of mythologies:

“It was also seen that this collective mythology arose in the nineteenth and twentieth centuries by historians involved in many sides of the debates over Darwin’s discoveries, and from there latched onto the public imagination at large” (back cover).

What is behind all this? The author suggests the ultimate cause of this conflict:

“We cannot make too much of anecdotes alone, but there does seem to be enough evidence to support the claim that beneath the so-called war of science and religion the true battle was against the traditional notions of hell, salvation and punishment” (p. 291).

The author provides useful biographical information. We learn that Newton was a Christian (p. 51), but that he did not believe in the Trinity (p. 54). We see that Darwin’s theory did not cause him to doubt the existence of God:

this doubt came about because of the later death of his father, and daughter Annie (p. 97).

Peterson is not sympathetic to creationists. He follows Ronald Numbers in suggesting that 20th century creationists held to extreme positions (namely the young earth and Flood geology) that were not held by most of those in the 19th century who considered themselves creationists. He also buys into the argument that ID (Intelligent Design) is just a dressed-up version of 20th-century creationism.

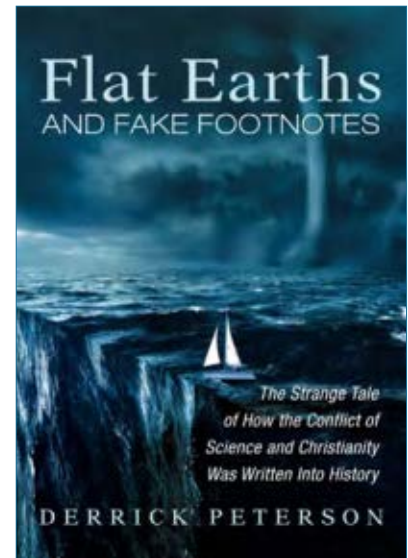
The author has an ‘everything you believed is wrong’ mindset. On one hand, Peterson seems practically to deny the existence of atheism. For instance, he sees Voltaire, John William Draper, Andrew Dickson White, and even Thomas Huxley as anti-clericalists rather than opponents of traditional theism. He sees the ‘discrediting’ of Paley’s design argument as a relocation of God’s creative activity into providential care, rather than an abolition of God entirely. On the other hand, he shows how many of the attacks on traditional theism were, and are, unfair, and that is the focus of my review.

Tertullian misquoted. Why so?

Peterson remarks:

“‘I believe, because it is absurd’—the most famous statement that the great theologian Tertullian of Carthage never said Sadly, it also embodies today what is a fairly standard opinion regarding the history of faith and science—namely that Christianity as a faith, or religion, is characterized by the embrace of the ridiculous precisely because it has no evidence” (p. 135).

However, Tertullian did say something similar. He argued that something



believable is more likely to be accepted than something totally fantastic. To the Greeks and the Jews, a bodily resurrection was nonsense. Therefore, Tertullian argued, the apostles would not be arguing for the bodily Resurrection of Jesus Christ unless it really happened. Otherwise, the apostles would knowingly be discrediting themselves by repeating fantastic tales.

Demons were not a reductive explanation for illnesses among early Christians

It is commonly alleged that Christianity was, from the beginning, fraught with superstitions, and that demons and other supernatural causes were freely invoked for what was not understood. This is far from the truth. Peterson comments:

“A close reading of the New Testament however demonstrates that only in three cases do illness and demonic possession even overlap. The majority of cases in Scripture readily distinguish Jesus’ healing from exorcisms. There is, moreover, a remarkably naturalist description of the etiology (that is, the origin and cause) of disease. Even in cases of epilepsy—which is often used as a classic example of a natural illness

being mistaken for possession—the majority of cases were given purely physiological explanations by Christians And, yes, praying, laying on of hands, and anointing with oil should be utilized for the sick. But these were in concert with the practice of physicians, not in competition with them” (p. 239).

No dark ages

Against the view that the Middle Ages was a time of disinclination towards learning, Peterson tells the contrary. He reminds us that this period “held books and writing up with an almost totemic reverence” (p. 228).

Nor were the Middle Ages a time when there were virtually no inventions. Peterson corrects this misconception:

“A list of all innovations in the Middle Ages would take us far too long, and for our story is somewhat beside the point. This era post-Rome but pre-Renaissance often lumped as a thousand-year period where nothing happened (except perhaps bloodshed and disease) turns out to be rather, ‘one of the great inventive eras of mankind’ as machinery and technology were developed and more importantly put into use ‘on a scale no civilization had previously known’” (p. 233).

The deeply entrenched flat-earth myth

The roundness of the earth has been known since the time of the pre-Christian Greeks, and belief in the flat earth was never a part of Christian thinking. Peterson unambiguously states:

“‘We can state categorically’, says British historian of science James Hannam, ‘that the flat earth was at no time ever an element of Christian doctrine, and that no one was ever persecuted or pressured into believing it’” (p. 179).

Now, there was a sixth-century geographer named Cosmas Indicopleustas who advocated a flat earth. But he had essentially zero influence in medieval times and was only rediscovered and put in the limelight by 19th-century critics of Christianity (pp. 186–188). Before that, no one would have thought to have raised such an argument against Christianity. Peterson quips:

“None of the great eighteenth-century polemicists against Christianity—Edward Gibbon, David Hume, Denis Diderot, and others—ever accused the scholastics of believing in a flat earth” (p. 196).

A myth persists when it serves a purpose. Peterson identifies the purpose:

“The flat earth has been a convenient staple invoked in order to emphasize how humanity has advanced out of an age of superstition and religious ignorance for a while now. The historian of science Lawrence Principe records that over the course of a decade nearly 70 percent of his students—mainly American—were taught in grade school that Columbus set sail to prove that the world was round” (p. 178).

Note that the book cover shows a ship about to sail off the edge of a flat earth.

The flat earth was also applied retroactively to anyone who challenged Darwinism. Peterson comments:

“Far from being confined to the fictional imagination of Irving or the academic networks of Letronne, after the publications of Darwin’s *Origin of Species*, the flat earth migrated into the polemical toolbox of evolutionists (some Darwinian, some otherwise) to use as a bludgeon against any who doubted the way the new evolutionary winds were blowing” (p. 198).

There is an irony to all this. Attempts were made to discourage Columbus from making his trip—not

because the earth was flat, but because it was *round and too large* to circumnavigate without his men starving (p. 182). Columbus accepted the smallest proposed value for the earth’s circumference, and made his historic trip. (We can add to this. If North and South America had not existed, Columbus would have been required to travel straight from Spain to China. His ships would long have run out of provisions, even on the presently sized Earth. Later, the starvation of many of Magellan’s men showed that even the Pacific Ocean alone was barely manageable.)

The Spanish Inquisition in perspective

The alleged horrors of the Inquisition are tempered by Peterson, who remarks:

“In other words, like so many things in this story, ‘The Inquisition’ is an evolving mythology. Curiously, not only have the judgements of the Inquisition have [sic] been shown to be more tolerant than court decisions of the different states, using torture far less than state courts. Their methods of due process led directly into modern legal systems along with Church canon law. Indeed, the use of torture *declined* in the West, because inquisitors ‘themselves were skeptical of the efficacy and validity of torture as a method of conviction’” (p. 241).

Did Luther inveigh against Copernicus?

Martin Luther is quoted as defending geocentrism by citing the Book of Joshua, wherein God stopped the earth and not the sun. However, this quote attributed to Luther is of dubious provenance, as pointed out by Peterson: “First of all, it was not recorded or authorized by Luther himself but by someone present at the Table Talk

who did not publish these remarks until after Luther's death" (p. 274).

In addition, Luther's purported statement can be interpreted in different ways. Luther is quoted as saying that Copernicus "wishes to turn the whole of astronomical science upside down." So perhaps this has less to do with defending geocentrism and more about Copernicus usurping a lot of attention.

Why Galileo? Why not Copernicus?

Galileo was 'persecuted' by the Church not for teaching heliocentrism, but for arrogantly proclaiming heliocentrism a proven fact, even though the science of his day did not justify such a conclusion. His 'persecution' consisted of house arrest.

The usual effort, to make Galileo a scientific martyr for his belief in heliocentrism, immediately encounters the following paradox, described by Peterson:

"Nonetheless, a major question poses itself: why Galileo? Why condemn him? If, as it was just represented, the issue was truly about heliocentrism—the idea that the sun, and not the earth, was at the center of our solar system—why did the Church not persecute Copernicus, whose work *On the Revolution of the Spheres* clearly did challenge the Aristotelianism of many in the church, and by the time of Galileo's condemnation had been circulating for nearly ninety years?" (p. 255); (figure 1).

Some have tried to account for this paradox by claiming that Copernicus was not that well known, and so Galileo's ideas were the ones that impacted the church. This will not do. Peterson presents evidence that the work of Copernicus was in fact widely read (p. 267).

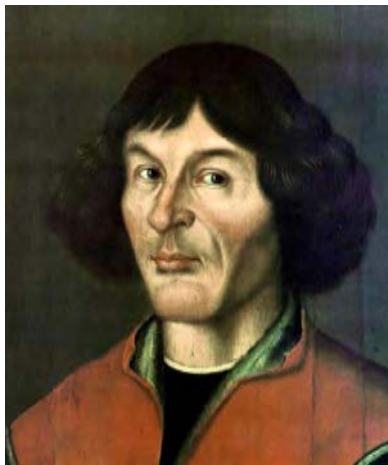


Figure 1. Toruń portrait of Nicolaus Copernicus (c. 1580). Galileo fell afoul of the Church for dogmatically claiming heliocentrism, even though the science of his day did not prove this. He could not have been 'persecuted' for his heliocentrism because Copernicus discovered and publicized heliocentrism for nearly a century before Galileo.

Galileo in proper perspective

The author treats the trial of Galileo as almost a non-event. He comments: "This was not 'science against the church', but rather a struggle of different understandings of 'science within the church'. Beyond the Jesuits, most Catholics considered it 'a local Italian imbroglio' and not only ignored the calls for censorship, but continued circulating both Copernicus and Galileo [emphasis in original]" (p. 268).

Giordano Bruno: a made-up martyr for science

Peterson writes: "Bruno wanted to die a martyr for his theologies, and the Church was more than happy to oblige ... The truth is that Bruno's was an almost forgotten case until nineteenth-century anti-clericalism found in it a parallel to Galileo and so another weapon with which to needle the Church by creating a mostly fabricated martyrology of science ...

'the legend that Bruno was prosecuted as a philosophical [or scientific] thinker, [or] was burned for his daring views on innumerable worlds or the motion of the earth, can no longer stand'" (p. 258).

The Scopes Trial was not about banning the teaching of evolution

Against the caricature of fundamentalists fighting against enlightenment, one might be surprised to learn that the Tennessee law did not outlaw the teaching of evolution itself. It only banned teaching about human evolution. Peterson comments:

"The Butler Act ... far from outlawing the teaching of evolution generally, specified that the illegal teaching consisted in promoting opinions on *human* origins from lower animals ... As such, Scopes could have indeed taught evolution—even quite thoroughly—and not have violated the specific parameters that had been set as guards over Tennessee's youth [emphasis in original]" (p. 291).

Peterson adds that:

"Even when Bryan was called to the stand to give his supposedly 'expert' testimony on Scripture and science, his objections to evolution were not based upon the idea of a young earth, or that evolution contradicted the so-called 'literal' meaning of Scripture. Rather ... it remained clear that his concerns were steadfast in their resolve to target the broader naturalistic and anti-theistic interpretations that had become attached to evolution" (p. 299).

Finally, Peterson argues that the Scopes Trial had less to do with the Bible, and more with the nature of public schooling in the American South. He thus explains:

"The conclusion that must be drawn from this is that the anti-evolution law and its supporters were attacking evolution not because of its

conflict with Scripture, but because of its allegiance with compulsory education and the broader philosophical and ethical divide this represented in Southern culture” (p. 293).

No noble savages

One common line of attack on Christianity revolves around the dominion mandate. We are told that it was a licence for humanity to ruthlessly exploit the earth. Furthermore, according to this anti-Christian narrative, humans lived in peace with each other, and in complete harmony with the earth, until they were exposed to this teaching.

Derrick Peterson points out that the word ‘dominion’ in the Bible, *rada* (Hebrew), far from calling for aggressive exploitation, was actually a soft expression. It was used, for example, to describe Solomon’s benevolent rule. The word for ‘subdue’ is also an innocent one. It is the same one used in reference to working and tilling the earth. There is nothing harsh about doing that.

Finally, in no sense was pre-Christian man peaceful, nor solicitous of the natural environment. Peterson comments:

“Deforestation, massive brushfires to control animal migration, tribal warfare, even large-scale animal depopulation are all part and parcel of the various stories of Neolithic humanity recounted by the long memories of stone” (p. 250).

Conclusion

One can be astonished to learn how much received wisdom is not true. This is especially true of common statements against Christianity, especially of some (flat earth) that are remarkably persistent.

How many ways can one compromise on creation?

Original Sin and the Fall: Five views

Stump, J.B. and Meister, C. (Eds.)

Intervarsity Press, 2020

Lita Sanders

Salvation by grace through faith in Jesus Christ is the central tenet of Christianity. So the question of why we require salvation in the first place is very important. This ‘five views’ book explores a range of views regarding Original Sin and how we find ourselves in the predicament that Christianity purports to solve.

This book gives each of the contributors the chance to present their own view on the topic at hand in their own chapter, then to respond to the other views in a further chapter. This format has strengths and weaknesses. They give different perspectives on the same issue, but it can be hard for the layperson to weigh the different perspectives to see which is more biblically faithful.

The editors are J.B. Stump, vice president of BioLogos, and Chad Meister, professor at Bethel University. The five views are described as Augustinian-reformed, moderate reformed, Wesleyan, Eastern Orthodox, and Reconceived.

Someone unfamiliar with the theology of the various contributors might come away with the unfortunate notion that only the Augustinian-reformed camp has those who are interested in the historical aspect of Genesis and the importance Paul and the other biblical writers place on Adam as the first genealogical link on the human



family tree. In fact, there are those in the reformed, Wesleyan, and Eastern Orthodox camps that hold strongly to a historical Adam, so the differences in the conceptions of Original Sin could have been more clearly defined if the contributors had the same view of the historical Adam. The ‘moderate reformed and reconceived’ views seem to exist solely to harmonize Genesis with evolutionary biology.

Augustinian-reformed

Hans Madueme represents the Augustinian-reformed view and is the only one who takes a strong stand for a historical Adam, and makes statements questioning the primacy of evolutionary scientific consensus. He points out that the rest of the OT and NT takes Genesis 1–3 as historical (p. 13), and even that Christian eschatology requires a historical Fall:

“The Christian conviction that suffering, sin, and death will disappear

at the eschaton hinges on the same divine revelation that affirms the goodness of prelapsarian creation. If we deny the latter, on what grounds can we hope for the former?” (p. 16).

Madueme also points out the concerning implications of theistic evolution:

“Evolutionary creationists instead reimagine suffering and death not as a lapsarian affliction but as the necessary cost of the freedom God gave creation to be itself; or, as some put it, this vale of tears was the only way for God to secure the beauty, complexity, and diversity of nature. ... Such evolutionary hamartiologies render natural evil (and possibly moral evil) intrinsic to divine creation, or alternately, evil becomes a dualistic reality existing alongside God and intruding itself into his creation.” (p. 17).

Furthermore:

“Evolutionary doctrines of sin also raise difficult christological and soteriological questions. If human beings inevitably sin because of underlying biological forces, then Jesus Christ either was not completely free from sin (i.e. deny his impeccability) or did not fully participate in bodily human nature (i.e. deny his humanity)” (p. 31).

Moderate reformed

Oliver Crisp represents what he called a “moderate reformed view”. It seems differentiated from Madueme’s chiefly by the refusal to make any historical claims whatsoever from the biblical text, particularly any which would contradict evolutionary orthodoxy. For instance:

“The moderate Reformed doctrine of sin does not require an original pair, nor does it require monogenism (the notion that we are descended from an original pair). However, it does not deny that there was an

original pair from which we are descended either. Instead it is a doctrine that makes *no* judgment about this matter” (p. 37).

However, the only reason to take this ahistorical view is to capitulate to the evolutionary view. It is also foreign to the thought of the NT authors to speak of theological truth divorced from the way God has acted and revealed Himself in *history*.

Wesleyan

Joel Green represents the Wesleyan view, but unlike Wesley (figure 1) himself, does not necessarily view a historical Adam as integral to that. Green himself says, “Wesley understood Genesis 3 as a fall narrative. With this story of sin’s etiology, he could underscore the need for a new birth” (p. 61). Green, however, is

not content with what Wesley actually believed, or even with how later Methodists and Wesleyans developed the doctrine of Original Sin. Rather, he engages in a ‘what-if’ scenario:

“Given his [Wesley’s] methodological commitments, we might more easily imagine his rethinking the doctrine than anticipate his outright rejection of either Scripture or science.

“Taken together, these data and ruminations prove to be hospitable to a fall narrative, although not the one traditionally associated with the doctrine or original sin. In this alternative account, we might imagine our early ancestors as creatures whose lives were not yet clouded by the haze of spiritual darkness or the muddle of decisions that eventually would envelop the human



Figure 1. John Wesley's view of Original Sin rested on a historical interpretation of Genesis 3.

family as it turned away from God” (p. 76).

The problem with this is that Wesley himself never showed an inclination for such theorizing about Genesis. And if Green wants his fellow Wesleyans to adopt this evolution-friendly interpretation, he needs to offer some evidence that it is compatible with the NT authors’, let alone Wesley’s, interpretive framework.

Eastern Orthodox

Louth’s Eastern Orthodox chapter shows many differences between the theology of the other four contributors and his own theological outlook. Rather than ‘Original Sin’, he prefers the term ‘ancestral sin’. He believes that

“Western theology tends to narrow the focus of theology to the redemption of fallen humanity. How does Orthodoxy escape from this? Fundamentally, I suggest, by beginning in the beginning—with creation, and within that creation the fashioning of the human” (p. 80).

Orthodox anthropology says:

“The purpose of the incarnation is not just to overthrow the entailment of Adam’s sin but to bring humankind to share in the divine life, to make humans ‘participants of the divine nature’ (2 Pet 1:4). As St. Athanasius famously put it, the word of God ‘became human so that the human might become God’” (p. 80).

As Madueme counters in his response to Louth:

“Not so helpful, however, is his insistence that humanity moves from a lower (created) to higher (deified) state. This picture, so central to Eastern Orthodoxy, invites the worry that God gave us less than his best at creation. Louth renders God partly responsible for the deficient condition of original humanity, for Adam and Eve were imperfect from the beginning and thus needed to ascend to a higher

state. Part of the genius of the fall doctrine is that it sidesteps this troubling scenario” (p. 138).

‘Reconceived’

The most radical chapter is by Tatha Wiley, who writes from a Roman Catholic perspective. As Madueme characterizes her chapter in his response:

“I am mystified, however, that Wiley feels the need at all to reconceive a doctrine of original sin. She believes Adam and Eve never existed, Genesis 1–11 is not historical, Paul’s views about Adam should be rejected, and so on, thereby denying the canonical data that informed the doctrine of original sin in the first place. Wiley wants the key insights of original sin without the historical and metaphysical baggage, having her cake and eating it too. I am delighted she still cares about original sin, but it is not clear to me why she does. Her own commitments sever the roots from which the doctrine first bloomed” (p. 128).

He continues:

“She takes as a given that doctrine *must* change in light of the scientific consensus, although she never wrestles with the implications of her position for doctrinal development. Her method gives science unprecedented dogmatic power and threatens the very idea of Christianity as a revelatory faith. In Wiley’s defense, some of my other interlocutors resonate with her on this point (although less radically); she is just the most forthcoming” (p. 128).

Historical Adam vs evolutionary orthodoxy

This is a book about how people from different theological positions view the doctrine of Original Sin. While not directly about the historical Adam or how to interpret Scripture

in an era where evolutionary biology challenges us to defend the Bible’s history regarding origins, it is not surprising that every contributor felt the need to address the historical Adam.

It is unfortunate that only Madueme even raised the possibility of maintaining a historic interpretation of Genesis even if that entails rejecting ‘modern scientific consensus’. This gives the erroneous appearance that only some of the reformed defend the historical Adam. I personally know those in all the traditions represented in the book who strongly affirm a historical Adam.

This book is interesting, and it may be useful for creationists to read the theological perspectives of eloquent scholars who disagree with our perspective, as well as Madueme’s excellent responses. It is disappointing, however, that one of the most glaring takeaways was of the wholesale surrender of many theologians to the evolutionary view of human origins.

Irreducible complexity remains a fatal problem for Darwinian evolution

A Mousetrap for Darwin: Michael J. Behe answers his critics

Michael J. Behe

Discovery Institute Press, Seattle, WA, 2020

John Woodmorappe

Author Michael J. Behe is a leading activist in the Intelligent Design (ID) movement. He is Professor of Biological Science at LeHigh University. Behe is a biochemist, and much of this work is rather technical and biochemically oriented in his back-and-forth polemics with leading evolutionists. Since biochemistry is not my field, I do not elaborate on this subject in my review. Rather, I focus on broader principles.

The author addresses many evolutionary objections to ID. The reader who has followed this issue for many decades, as I have, may be impressed by the fact that the same bogus arguments used against creationists are now being recycled and used against ID.

Behe has a sense of humor. When an evolutionist objected that ID members extensively quoted evolutionists [BTW, the same objection once used on creationists], Behe retorted, “What is a book concerning evolution supposed to contain if not quotes from evolutionists? Quotes from accountants?” (p. 56).

The author’s personal journey

It was disillusionment with Darwinian evolution, and not religious teachings, that led Behe to embrace ID. He writes:

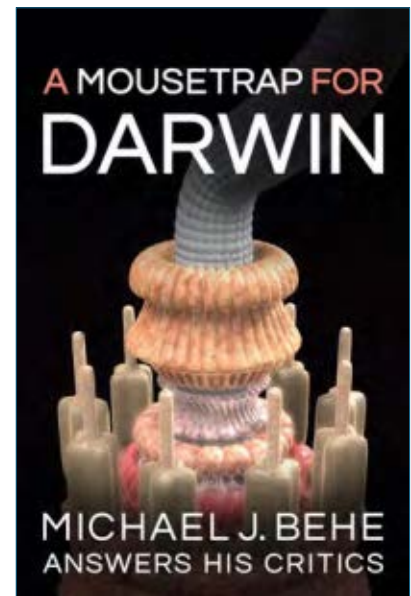
“Perhaps I can help. After all, I used to believe that a Darwinian process did indeed build the wonders of life; I had no particular animus against it. Yet I believed it on the say-so of my instructors and the authority of science, not on hard evidence. When I read a book criticizing Darwin’s theory from an agnostic viewpoint it startled me, and I then began a literature search for real evidence that random mutation and natural selection could really do what was claimed for them. I came up completely empty. In the over thirty years since then, I’ve only become more convinced of the inadequacy of Darwinism, and more persuaded of the need for intelligent design at ever-deeper levels of biology, as detailed in my books” (p. 450).

Nothing has changed. Behe still concludes that “Random mutation/natural selection works great in folks’ imaginations, but it’s a bust in the real world.” (p. 109).

The mousetrap as an example of irreducible complexity: frivolous objections

Author Behe points out that he chose the mousetrap as an example of intelligent design because the layperson can more easily grasp its irreducible complexity than that of a folded protein. It is plain to see that the mousetrap must have all its parts in place before it will work at all: There is no such thing as a half-mousetrap.

Some evolutionists have argued that there are many ways to kill a mouse other than the mousetrap (for example, glue-covered cardboard). This is true, but is completely irrelevant to the existence of the mousetrap and its



putative origins without an intelligent designer. In addition, many different kinds of metal-and-wood mousetraps can be built (figure 1), but this does not vitiate irreducible complexity. In fact, each type of trap has its own irreducible complexity.

Other evolutionists, invoking exaptations, have noted that the mousetrap components, when acting alone, have various functions. For instance, the spring is used in many different devices. They posit that the different components got together and acquired new functions once they combined in the mousetrap. But this does not eliminate the need for an intelligent designer; it only changes its role a bit. An intelligent designer is still needed to assemble the parts and harmonize their hitherto-disparate functions; to get each component to work near-perfectly, and to do so simultaneously, with every other component in the mousetrap. Otherwise, there is no functioning mousetrap at all.

Attempts to assemble the mousetrap step by step

Some evolutionists have argued that a simpler mousetrap is possible. One suggestion involved the use of a spring-alone ‘mousetrap’, wherein the

spring ends are abutted against each other, in perpendicular fashion, and with just the right tension, to become uncocked when the mouse takes the cheese.

Behe takes a closer look at this. To begin with, the spring-alone ‘mousetrap’ is itself an example of irreducible complexity. Unless the spring-ends are abutted against each other in a very precise way, and with just the right amount of tension between them, there is zero possibility of catching a mouse. Intermediate stages are useless and have no selective value. So even a spring-alone ‘mousetrap’ could not arise by small, successive, naturally selected changes as required by Darwinism.

In addition, the spring-alone ‘mousetrap’ is incapable of being straightforwardly imported into the regular-mousetrap design. The ends of the spring-alone ‘mousetrap’ are deployed in a manner completely different from the way they are deployed relative to the trigger mechanism and the lever in the regular mousetrap. Again, no series of small, successive Darwinian changes, each naturally selected, will transform a spring-alone ‘mousetrap’ into a workable component of the regular mousetrap. This owes to the fact that the intermediate states will not function as mousetraps, and so natural selection will not favour their survival.

So we are right back to an intelligent designer. This time an intelligent

designer is needed to bend the spring ends so that they jibe perfectly with the trigger mechanism and the lever in the regular mousetrap. Clearly, then, the postulated spring-alone ‘mousetrap’ is in no sense a simplified version of the regular mousetrap. Nor is it in any way a potential stage in the hoped-for gradual Darwinian appearance of the regular mousetrap.

Intelligent Design (ID) is not a religious teaching

Opponents of ID never tire of trying to dismiss it as a religion and as something requiring a prior belief in a deity. It is not and does not. Behe writes: “The conclusion of intelligent design flows naturally from the data itself, not from sacred books or sectarian beliefs” (p. 31).

In my review, I use the word ‘Designer’ with a capital ‘D’ in deference to the Christian belief that God is the Designer. However, a designer or Designer can be inferred solely from reason and observation, just as a designer can be inferred from situations that have nothing to do with religion. For instance, Behe cites the example of SETI (Search for Extraterrestrial Intelligence). When ‘listening’ to radio waves coming from space, attempts are made to identify an intelligently designed radio signal from the background, unintelligent ‘noise’.

Now some evolutionists have argued that we can accept a designer

for the mousetrap because we see designers making them, but we cannot accept a Designer for living things because we never see this process at work. The SETI example, above, dispenses with this silly argument. We can discern a designed radio signal even though we cannot comprehend, let alone see, the extraterrestrial entity that made it.

Design or non-design are inferred in everyday situations. Behe writes:

“Forensic scientists routinely make decisions of whether a death was designed (murder) or an unfortunate accident. Archeologists decide whether a stone is a designed artifact or just a chance shape” (p. 59).

Again, this has nothing to do with any kind of prior commitment to religion.

Ironically, perhaps, it is evolutionists that introduce religion into the picture, as when they regularly make ‘poor design’ arguments. Behe will have none of that. He comments:

“On a different note, I’m glad Professor Doolittle likes Rube Goldberg too, but unfortunately it supplies what I think is his rock-bottom reason for deciding that natural selection produced the [blood] clotting cascade: ‘no Creator would have designed such a circuitous and contrived system’. Well, Doolittle is a good scientist, but he’s no theologian, and he doesn’t serve science well when he lets his theological



Figure 1. Although many different kinds of mousetraps can be built, this does not vitiate irreducible complexity.

presuppositions influence his scientific judgment” (p. 59).

Touché!

ID is not creationism

Quite a few evolutionists hope that the ‘bad smell’ of creationism will attach itself to ID. So they repeat the hoary argument that ID is just ‘religion in disguise’—a ‘dressed up’ version of creationism. It may be good propaganda, but it is completely contrary to the facts.

Behe spurns the label ‘creationist’ (p. 62). In fact, most of his views are indistinguishable from those of the standard evolutionist. He believes in an old Earth and in the common ancestry of all living things (p. 218). He indicates that he would be just as surprised as anybody else at the discovery of a human skeleton in the Precambrian. So he accepts the entire evolutionary-uniformitarian package, and believes in the reality of phylogenies. For example, he concurs with the premise that tetrapods evolved from fish (p. 417).

In order to understand Behe’s position, one must not confuse the *fact* of design with the *process* of design. He stresses that “design focuses on the endpoint, not the process. Arguments about process require further evidence beyond that for the bare conclusion of design” (p. 474). For this reason, there is, at this stage of evidence, no room for any kind of supernatural, fiat creation in Behe’s thinking. He rejects the claim, attributed to him, that the irreducibly complex system must have originated *ex nihilo* by Divine fiat (pp. 63, 466). Furthermore, he provisionally rejects any kind of miraculous origin for irreducibly complex systems (p. 473). Rather, Behe thinks in terms of some form of guided evolution to account for irreducibly complex systems.

There is the argument (also long used against creationism) that ID relies on negative evidence: The perceived inability of Darwinism to account for

a living feature thus becomes evidence of ID. But, not mentioned by Behe, the same can be said of all other situations. Thus, in SETI, the failure of random ‘noise’ to account for certain extraterrestrial radio signals becomes evidence for a designed source of these radio signals. Likewise, the failure of accidental death to account for an unexpectedly dead person becomes evidence for a purposeful death (murder). Again, this is everyday reasoning, and has nothing to do with religion.

Behe realizes that conclusions of intelligent design, like all conclusions in science, are tentative. It is possible that such things as the self-organization of matter will eventually prove capable of explaining design without a designer (pp. 139–140). However, science must be based on what is presently known, and not on what perhaps may eventually develop. Right now, the best explanation for irreducible complexity is intelligent design, and it should be embraced.

ID is not just ‘natural laws in action’

Having seen that ID is not creationism, we must avoid the other extreme—of wrongly supposing that ID considers the presumed creative powers of nature sufficient to account for all living things. It does not.

In evolutionary thinking, Nature is sometimes endowed with creative powers. Behe points out that ID adds a layer of design to that provided by nature. He writes:

“By ‘intelligent design’ I mean to imply design beyond the laws of nature. That is, taking the laws of nature as given, are there other reasons for concluding that life and its component systems have been intentionally arranged?” (p. 130).

Defining away ID as science

Some evolutionists have argued that science is whatever the scientific

community says it is—since prominent scientific organizations have decreed that ID is not science, therefore it is not science. This sociological view of science, and reasoning against ID, was adopted by the judges in the US court cases that involved ID.

Behe points out that saying in advance what is and is not science only risks conflating the presumptions and prejudices of the current group of practitioners with the way that physical reality must be understood. Science should be an unrestricted search for the truth about nature based on reasoning from physical evidence (p. 482). It should not start with preconceived notions.

Others have argued that scientists should stick to methodological naturalism and thereby exclude ID as science. This, too, means that science is being ruled by preconceived notions.

Finally, there are those who say that invoking a designer is variously an argument from ignorance, an act of ‘giving up’, and essentially a copout. This, too, is a preconception—that a naturalistic, non-intelligent cause is the correct one (p. 146).

ID is falsifiable

For a theory to be scientific, it has to allow for it to be potentially proved wrong. ID qualifies. Behe comments: “To falsify design theory a scientist need only experimentally demonstrate that a bacterial flagellum [figure 2], or any other comparable complex system, could arise by natural selection. If that happened I would conclude that neither flagella nor any system of similar or lesser complexity had to be designed. In short, biochemical design would be neatly disproved” (p. 50).

Some evolutionists, such as Jerry Coyne, have argued that ID proponents ‘move the goalposts’. According to their argument, whenever such-and-such a complex system is shown not to need

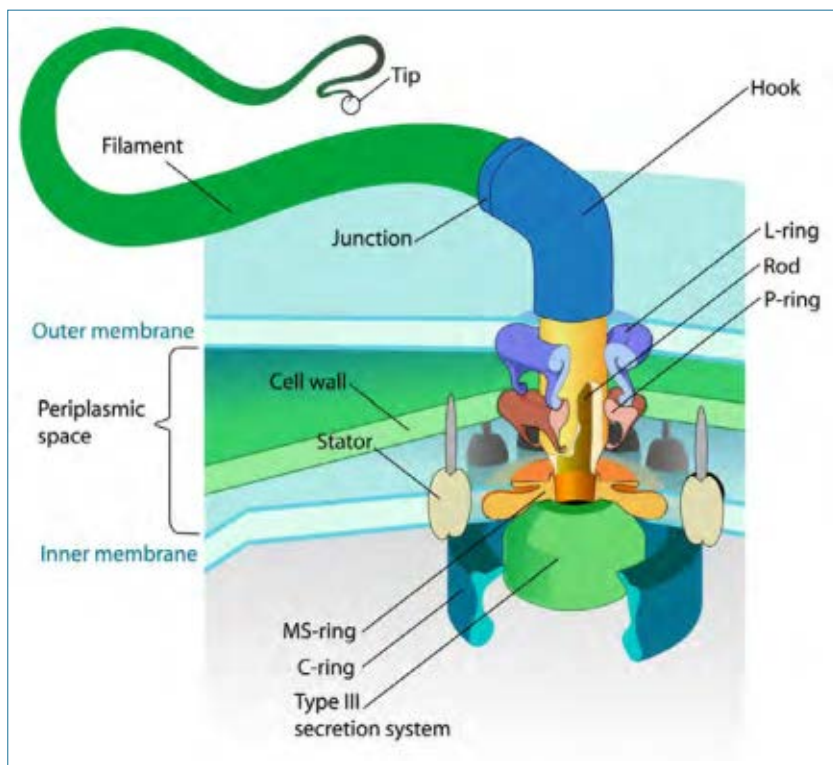


Figure 2. The bacterial flagellum, an example of irreducible complexity

a designer, ID proponents just latch on to some other complex system and proclaim that it is the one that needs a designer. This ‘moving the goalposts’ argument is fallacious. From Behe’s quote in the preceding paragraph, it is evident that proof of a non-designer for a complex system would apply to *all* systems of comparable complexity, and not just that particular one.

The party line, as enunciated, for example, by the (US) National Academy of Sciences, is that ID is not falsifiable, and therefore not a part of science (p. 130). However, evolutionists such as Russell Doolittle and Kenneth Miller have claimed that their arguments have falsified ID. So, evolutionists try to have it both ways; simultaneously arguing that ID is not falsifiable, and then arguing that ID has been falsified (pp. 130–131). They cannot have it both ways! [Note that exactly the same evolutionistic gambit was tried against scientific creationists decades ago.]

Arguably, non-design is not falsifiable

Accusations of non-falsifiability can be turned around, and validly attached to evolution, just as they were decades ago in creation–evolution debates. Behe updates this consideration. He comments:

“If a scientist went into the laboratory and grew a flagellum-less bacterial species under selective pressure for many generations and nothing much happened, would Darwinists be convinced that natural selection is incapable of producing a flagellum? I doubt it. It could always be claimed that the selective pressure wasn’t the right one, or that we started with the wrong bacterial species, and so on. Even if the experiments were repeated many times under different conditions and always gave a negative result, I suspect many Darwinists

would not conclude that Darwinian evolution was falsified” (p. 132).

Do not confuse survival of the fittest with the arrival of the fittest

In his response to evolutionists, Behe points out that they resort to speculation and just-so stories. He remarks:

“From my point of view, in all of the cited papers the evolutionary explanation takes the form ‘system X developed because it would help the cell do Y,’ without noticing the difficulties of making X by a blind process. It’s like saying, ‘Air conditioners developed to enable more people to work indoors in the summertime’” (p. 61).

Evolutionists often mix processes with inferred outcomes. Behe comments:

“... the argument for intelligent design in biology has little to do with protein-sequence similarity or common ancestry, for the same reason that knowing all the parts are made of metal does not explain the mousetrap ... doesn’t even begin to explain how a mousetrap could be built step by step by a random process” (pp. 177–178).

Let us take this further. Behe quotes evolutionist Jerry Coyne, “First, as both Dawkins and I point out, if random mutations cannot build complexity, how can they possibly have been so effective in artificial selection of plants and animals?” (p. 227). Clearly, Dawkins and Coyne are *assuming* what they need to demonstrate, as unmasked by Behe:

“Because, of course, the genomes of many plants and animals already contain much developmental plasticity. Turning some existing genes or regulatory elements on or off, or tuning them up or down, or changing them slightly by simple, single mutations, can certainly affect the shapes and other properties of organisms somewhat. Artificial selection for such variants

can easily explain dog breeds and such, as I noted in Chapter 9. But of course that begs the question of where the complex systems controlling the organisms' development came from" (p. 227).

The blood-clotting cascade: gene duplication alone does not explain it

Behe perceptively comments: "But does gene duplication lead straightforwardly to the blood clotting cascade? No. The important thing to keep in mind is that a duplicated gene is simply a copy of the old one, with the same properties as the old one—it does not acquire sophisticated new properties simply by being duplicated" (p. 93).

Aerobic citrate metabolism: an observed evolutionary novelty?

Ever since 1988, Richard Lenski, of the University of Michigan, has been conducting the LTEE (long-term evolution experiment). He has, so far, cultured over 73,500 generations of *E. coli* bacteria, observing the changes that have occurred in this period of time.

Normally, *E. coli* only metabolizes citrate in an anaerobic environment. One day, Lenski discovered a new laboratory strain that did this in an aerobic environment. The evolutionistic triumphalists hyped this as an evolutionary novelty. Not quite. Here is how Behe assesses this situation:

"The gene duplication which brought an oxygen-tolerant promoter near to the *citT* gene did not make any new functional element. Rather, it simply duplicated existing features. The two FCT's comparing the oxygen-tolerant citrate transporter locus—the promoter and the gene—were functional before the duplication and functional after" (pp. 279–280).

Darwinian evolution stumbles with changes requiring even two mutations

Evolutionists glibly speak of neutral mutations becoming fixed in the population, and then a sequence of such mutations coming together with a successive mutation in order to make a substantial evolutionary change. It may be that way in theory, but the facts are very different.

Consider drug-resistant malaria. A certain mutation, K76T, considered to be neutral but now shown to be deleterious (p. 361), by itself confers not even a tiny bit of resistance to chloroquine, so we are not talking about an incremental, step-by-step increase in chloroquine resistance. Instead, a second mutation arises, and acts with K76T in order to make that malarial parasite resistant to chloroquine.

Behe analyzes this situation:

"The need for two specific mutations neatly explains the approximately billionfold increase in difficulty for the [malarial] parasite to evolve resistance to chloroquine versus other antimalarial drugs, such as atovaquone, which require only one It also illustrates the feebleness of the Darwinian mechanism when confronted with the need for even the tiniest amount of coordination—just two simple point mutations. The difficulties go up exponentially with the number of mutations required" (p. 405).

Some evolutionists have objected that there are many ways for a malarial parasite to acquire chloroquine resistance. Actually, there are potentially only a few. Behe remarks:

"Instead of a chloroquine pump appearing, maybe a chloroquine-degrading enzyme could have arisen, or maybe malaria's membrane could somehow be altered to stop chloroquine from entering the cell, or maybe the cell could become dormant until the chloroquine passed. But none of these scenarios happened. Why not? Because any evolutionary pathway leading to

these outcomes was even less probable than the pathway that occurred ... 1 in 10^{20} " (p. 354).

Behe's 1 in 10^{20} probability is based on the number of cells per malaria patient (a trillion) times the number of ill people over the years (a billion), divided by the number of independent events (10). (p. 332)

ID will win out in the end

Behe discusses the politics that has gone on in order to suppress and discredit ID. He remains unfazed by all this, and has this forecast:

"Nonetheless, I'm serenely confident that the Darwinian paradigm will collapse, and the idea of the intelligent design of life will eventually carry the day, even in the snottiest intellectual circles, even in state-controlled schools. This will happen not because of any particular thing that I or any other ID proponent has done or will do. Rather, it's simply because that's the way the biological data are headed. Virtually every week stunningly sophisticated new features of life are being uncovered by scientists, features that in any other context we would immediately recognize as designed. This evidence cannot forever be denied" (p. 461).

Conclusions

Darwinian evolution continues to be an inadequate explanation for living things that exhibit irreducible complexity. To the open-minded, intelligent design remains a viable explanation for this.

Reliable and accessible commentary

Genesis (Tyndale Old Testament Commentaries)

Andrew E. Steinmann
IVP Academic, 2019

Andrew S. Kulikovsky

Andrew Steinmann is a Lutheran biblical scholar and currently serves as Distinguished Professor of Theology and Hebrew at Concordia University in Chicago, USA. He has written many scholarly journal articles and a number of books and commentaries on the Bible, including commentaries on Ezra and Nehemiah, Proverbs, and Daniel. This volume on *Genesis* is part of the *Tyndale Old Testament Commentaries* series and replaces the original, and now very old (1967), volume by Derek Kidner. As with other updated volumes in the *Tyndale Commentary* series, this new commentary is much thicker and more detailed than Kidner's. Moreover, unlike Kidner's volume, which promoted the day-age view of the Creation Week, Steinmann adopts the traditional literal 'solar day' view advocated by Young Earth Creationists (YEC).¹

The *Tyndale Old Testament Commentary* series are designed to be non-technical and easily accessible commentaries on the English text, aimed at the busy pastor or preaching layman.

The commentary opens with an Introduction to Genesis where the author highlights that this book is the book of beginnings and relates to the beginning of the world, of sin, of God's promise of redemption and of

the nation of Israel, whom God chose as His people.

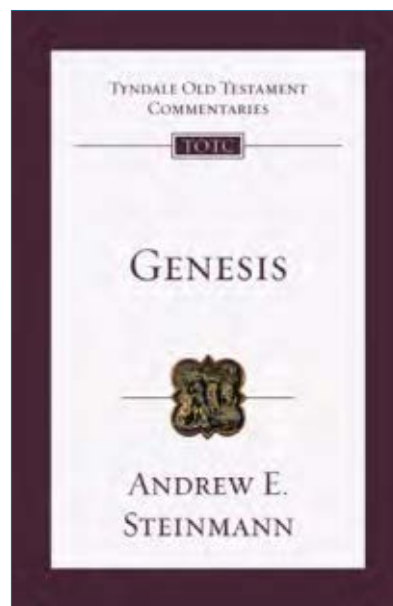
Authorship

Regarding the authorship, composition, and date of Genesis, Steinmann argues that the Pentateuch (including the book of Genesis) was compiled and edited by Moses. He cites evidence from the Pentateuch itself, the witness of the rest of the Old Testament, the witness of the New Testament, and post-Mosaic additions and glosses in the Pentateuch. However, since Genesis is entirely about events that occurred before Moses was born—the last event in the book, the death of Joseph, took place more than three centuries before Moses' birth—the case for Mosaic authorship is more vulnerable to challenge than for the other books of the Pentateuch.

Nevertheless, Jesus confidently asserted Moses' writing of the first book of the Torah. Indeed, John 1:17 says the Law was given through Moses. Jesus is quoted as ascribing the Torah to Moses without dispute or objection from his Jewish opponents (John 7:19–23). This passage assigns to Moses the covenant of circumcision in Genesis 17:1–27.

Documentary hypothesis

Steinmann includes a comprehensive discussion of the so-called 'Documentary Hypothesis', which claims Genesis is a patchwork conglomeration of several source texts (Jahwist, Elohist, Deuteronomist, and Priestly sources). He goes on to note the major flaws in this hypothesis. Firstly, the method of identifying the four source documents is highly subjective. The



alleged source documents have never been found and there is no historical evidence to indicate they ever existed. In any case, supporters of the hypothesis have never been able to agree among themselves as to the content of each document.

Another weakness of this hypothesis relates to the way it relies on the use of particular vocabulary to distinguish the various source documents. Steinmann rightly notes there are numerous problems with using vocabulary in this way. For example, two passages from different source documents may use similar vocabulary because they are addressing the same subject or describing the same events. In addition, even the use of synonymous terms does not necessarily indicate different traditions. Two words are rarely ever exactly synonymous "and their use may be determined by the different nuances in their denotations or connotations rather than by different authorship" (p. 11). In fact, even words or phrases that are assigned to one source document may appear frequently in another. For example, the term 'land of Canaan' is usually a characteristic of P (e.g. Gen. 12:5; 17:8), yet it appears frequently

in texts ascribed to both J (e.g. 42:5, 7, 13, 29, 32) and E (e.g. 44:8).

Steinmann points out that the Documentary Hypothesis depends heavily on two popular philosophical developments of the 19th century: the Hegelian philosophy of history and Darwinian notions of evolution. But contemporary historians recognize that the events associated with the historical developments of movements and ideas do not follow any such rigid, prescriptive pattern, and thus, they no longer employ Hegelian historical analysis. In addition, it is not possible to demonstrate that religion evolves in a Darwinian fashion from more primitive forms to more advanced forms.²

Toledot vs colophon

Steinmann also discusses the *toledot* formula that forms the structural breaks in the text of Genesis. He notes that P.J. Wiseman's contention that the *toledot* is a colophon (authorship note) is problematic because each *toledot* identifier more naturally describes the text that follows rather than the text that precedes. For example, Genesis 25:19 refers to the account of Isaac, but the preceding verses (12–18) list the descendants of Ishmael, whereas the subsequent verses list the descendants of Isaac. Similarly, Genesis 37:2 refers to the account of Jacob, but the preceding verses (36:1–37:1) list the descendants of Esau, whereas the subsequent verses tell the story of Jacob and his descendants.

Genre

Unfortunately, there is no discussion at all on the literary genre of Genesis. Steinmann appears to simply assume the book is historical narrative and processes the text accordingly. This is surprising given that the genre of Genesis has been the subject of much debate with numerous

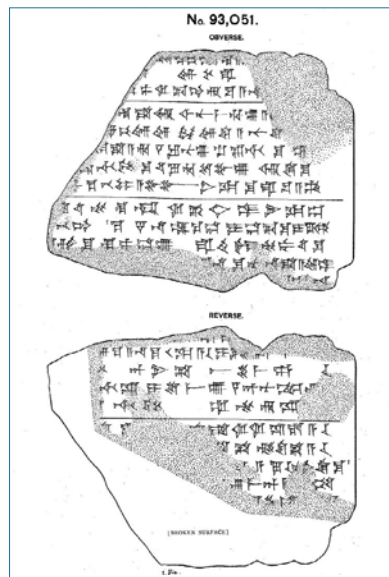


Figure 1. Steinmann shows that the alleged dependency of Genesis on the Babylonian *Enuma Elish* is dubious.

old-earth advocates claiming Genesis 1–2 is poetry, ‘prose-poetry’, analogical, or a literary framework.

Nevertheless, Steinmann is right to note that the focus of the book is continuously being narrowed. Genesis begins with all of creation and ends with the sons of Jacob in Egypt—the beginning of God’s chosen people. The literary structure of Genesis highlights the work of God as more attention is given to the line of Abram/Abraham.

Steinmann also examines the supposed parallels between the biblical creation account and other Near Eastern creation accounts. Regarding the Babylonian *Enuma Elish* account (figure 1), he points out there are several problems with viewing it as providing the Near Eastern background for the Genesis account. For example, the claimed etymological connection between *Tiamat* (Akkadian) and *tehom* (Hebrew) is dubious and controversial. In any case, the most distinctive thing about this account compared to the Genesis account, is the differences rather than the similarities.

Thus, a number of commentators have suggested that the Genesis account is a polemic against Near Eastern creation mythology in general and Egyptian mythology in particular. In other words, the Genesis account serves as a refutation of other ancient Near Eastern creation myths, even though it does not directly reference them.

(Chrono)genealogies

Young-earth creationists routinely argue that because the genealogies in Genesis 5 and Genesis 11 list the age of each ancestor at the time of what appears to be the birth of their descendant, the approximate age of the earth may be calculated by adding these numbers together. However, Steinmann offers a caution in doing this, arguing that the Hebrew words for ‘father’ (*ab*) and ‘son’ (*ben*) can at times denote ‘ancestor’ and ‘descendant’, respectively. Moreover, citing the *Theological Wordbook of the Old Testament*, Steinmann points out the verb translated ‘begat’ or ‘became the father of’ (*yalad*) does not always denote direct fatherhood:

“The word does not necessarily point to the generation immediately following. In Hebrew thought, an individual by the act of giving birth to a child becomes a parent or ancestor of all who are called a son of David and a son of Abraham, *yalad* marks the beginning of an individual’s relationship to any descendant” (p. 21).

This would mean that, for example, while Seth ‘begat’ Kenan’s ancestor when he was 90 (Gen 5:9), the focus moves to Kenan (5:12–14) as the next major figure only after Enosh’s full life of 905 years (5:11).

To argue his point, Steinmann points to the genealogy of 10 generations from Perez to David in Ruth 4:8–22, where the Hebrew word *yalad* is also used. In this instance, given that

there were 837 years between Perez and David, there had to be more than 10 generations between the two men. It appears that the author of Ruth deliberately omitted some generations so that Boaz would be listed as the honoured seventh person in the genealogy, and David would be the 10th generation.

According to Steinmann, a study of ancient Near Eastern genealogies has shown that genealogies tend to be limited to 10 generations at most, and many are much shorter. For Steinmann, this suggests that these genealogies may skip any number of generations, making it impossible to assume that adding up the years of pre- and post-diluvian ancestors of Abraham will yield the correct number of years from the creation of Adam to the birth of Abraham. Although it is clear that these genealogies sometimes consecutively list father, son, and grandson (e.g. Adam, Seth, and Enosh), Steinmann believes we cannot be certain that this is always the case. But Gerhard Hasel had rebutted this idea years ago, noting:

“The repeated phrase ‘and he fathered PN’ (*wayyôled* et-PN) appears fifteen times in the OT all of them in Genesis 5 and 11. In two additional instances the names of three sons are provided (Genesis 5:32; 11:26). The same verbal form as in this phrase (i.e. *wayyôled*) is employed another sixteen times in the phrase ‘and he fathered (other) sons and daughters’ (Genesis 5:4, 7, 10, etc.; 11:11, 13, 17, etc.). Remaining usages of this verbal form in the Hiphil in the book of Genesis reveal that the expression ‘and he fathered’ (*wayyôled*) is used in the sense of a direct physical offspring (Genesis 5:3; 6:10). A direct physical offspring is evident in each of the remaining usages of the Hiphil of *wayyôled*, ‘and he fathered’, in the OT (Judges 11:1; 1 Chronicles 8:9; 14:3; 2 Chronicles

11:21; 13:21; 24:3). The same expression reappears twice in the genealogies in 1 Chronicles where the wording ‘and Abraham fathered Isaac’ (1 Chronicles 1:34; cf. 5:37 [6:11]) rules out that the named son is but a distant descendant of the patriarch instead of a direct physical offspring. Thus the phrase ‘and he fathered PN’ in Genesis 5 and 11 cannot mean Adam ‘begat an ancestor of Seth’.”³

God spoke creation into being

Regarding the method of creation, Steinmann highlights that God uses His spoken word to create, and that—unlike other ancient Near Eastern creation accounts—Genesis emphasizes that God alone created the heavens and the earth and everything in them. In addition, Genesis 1 emphasizes that God created in six days. The repeated formula “and there was evening and there was morning, the Xth day” used to describe the creation days is not, as many have claimed, a mere literary feature that is an inconsequential part of a literary framework, but an important and key element of the description of the creation:

“This image of God with his hands in the dirt is remarkable; this is no naive theology, but a statement about the depths to which God has entered into the life of the creation. In contrast to the near Eastern creation accounts, God’s creation was good and perfect, without strife, conflict or contention” (p. 24).

To highlight the orderliness of the creation as opposed to the chaotic process envisaged by the pagan myths, Steinmann argues that Genesis presents the creation over six days as a logical and sequential process organized by God, albeit in a schematic pairing between two sets of three days (Days 1 and 4; Days 2 and 5; Days 3 and 6). Yet he acknowledges that this is only an approximation of what Genesis

demonstrates about God’s work, and that the pairings or parallels are partial and incomplete. Indeed, he recognizes that there are connections between pairs of days that do not fit into this scheme. For instance, the lights that God created on Day 4 are placed in the expanse created on Day 2. The sea creatures made on Day 5 inhabit the sea that was made on Day 3. Humans were created on Day 6 to rule over the animals created on Days 5 and 6. Steinmann adds that “it would be a false economy to pit the literary features of the text against its chronological features, as some have attempted.”⁴

Steinmann rightly acknowledges that the term ‘day’ is not always used the same way, even in the Genesis creation account, but notes that the real question is how to understand the phrases in which ‘day’ is used to demarcate the stages of creation. The creation account contains a variety of temporal terms: ‘beginning’, ‘evening’ and ‘morning’, ‘day’, ‘night’, ‘seasons and days and years’. The meaning of all these temporal terms is shaped by the linguistic context in which they appear. Therefore, Steinmann concludes:

“In the light of this, the term day is used in phrases that designate stages of creation to mark off a single cycle of daylight and night-time. It seems impossible to argue that all of the other terms are used in their usual sense to denote ordinary evenings and mornings, seasons and years, but that day is not ... it is a dubious argument to suggest that day means anything other than a single rotation of the earth upon its axis” (p. 27).

Regarding alleged contradictions and inconsistencies between Genesis 1 and Genesis 2 that the Documentary Hypothesis implies, Steinmann rightly posits that, rather than being two contradictory creation accounts, these two chapters are complimentary. Genesis 2 is clearly not a complete

account: the existence of the heavens and the earth is assumed; there is no mention of the sun, moon, and stars; there is no mention of the creation of sea creatures. Therefore, Genesis 2 is actually an expansion or elaboration of the description of the creation of human beings in Genesis 1.

The Fall

The consequences of the Fall are highlighted throughout the commentary. The first murder is related immediately after humans were expelled from Eden, and several times Genesis directly states that sin had become permanently attached to human nature (6:5; 8:2). The Fall also led to God providing clothing to Adam and Eve (figure 2) at the expense of the life of an animal, given the garments were made from animal skin.

Ultimately, sin led to the great ‘undoing’ of creation—the worldwide Flood at the time of Noah. The land that emerged from the primeval ocean on Day 3 is once again submerged in the waters of the Flood, and then re-emerges afterwards.

Noah is a kind of second Adam, since all subsequent human beings stem from him through his sons. Although Noah was initially judged to be righteous and blameless (Gen 6:9), he also gives in to sin in an echo of the Fall of Adam and Eve (Gen 9:20–27).

Other themes

Steinmann points to the notion of ‘God’s Chosen People’ as a prominent theme throughout the book of Genesis. God chooses his people by favouring a particular line of descendants. God chooses Seth over Cain, Shem over his brothers, Jacob (renamed Israel) over Esau.

‘Justification by faith’ is another important theme and is clearly demonstrated in the life of Abraham. Abraham believed the gracious promise of



Figure 2. The Fall led to God providing clothing to Adam and Eve at the expense of the life of an animal, given the garments were made from animal skin.

God that through him and his seed all the nations of the earth would be blessed. Despite Abraham not understanding how this prophecy would be fulfilled through the incarnation and death of Christ, he still trusts in God’s grace and promises: “Abraham believed God, and it was credited to him as righteousness” (Romans 4:3). Indeed, Hebrews 11 also indicates that Abel, Enoch, and Noah were also righteous through faith.

The commentary

Each pericope or section of text is treated with three separate sections: (1) Context, (2) Comment, and (3) Meaning. The Context section discusses the historical and literary context of the particular section of text. The Comment section provides more detailed commentary on the text itself. Though all verses in the text are covered, it is not strictly a verse-by-verse commentary. Given that this commentary is pitched at pastors and laymen rather than other scholars, there is no detailed Hebrew exegesis, though the author does make occasional reference to key Hebrew words and terms, along

with clear explanations. Finally, the Meaning section offers a brief summary and meaning of the text, along with any theological notions and implications.

Numerous ‘Additional Notes’ that discuss a particular topic, idea, or interpretation in more detail also appear throughout the commentary. Topics include ‘The seven days of creation’, ‘Knowledge of the name Yahweh in Genesis’, and ‘The ages of the persons in the genealogies of Genesis 5 and 11’.

Given the length of this commentary, I will confine my specific comments to the topics that will most interest the readers of this *Journal*: Creation and the Flood.

Protoevangelium

On the messianic promise in Genesis 3:15 (aka *protoevangelium*), rather than being a collective noun, the woman’s ‘seed’ should be taken as singular, given that whenever seed is used with singular verbs and adjectives and especially with singular pronouns it is always singular rather than collective. In this verse, the verb ‘strike’ (*shuph*; ‘bruise’ in some translations) is singular. Steinmann notes that it is used with a singular pronoun, even though a pronoun is not required by Hebrew syntax in this instance. The superfluous use of the pronoun emphasizes that God is promising a particular seed—a single descendant—of the woman who will crush the serpent’s head.

The word זֶרַע (*zera*‘) always conveys the concept of a close resemblance between the seed and what produced it. In other words, the descendant is like the ancestor—a human being like Eve—and this keyword *zera*‘ is used throughout Genesis to refer to the original promise of the Messiah, and the notion is further developed as the story of God’s people is elaborated.

Day 1

Steinmann notes that God is elsewhere identified as the Creator of heaven and earth (Isaiah 40:28; 45:18; Ephesians 3:8–9; Colossians 1:16). Therefore, the first verse (Genesis 1:1) cannot simply be a summary of everything else in the chapter, but must be a statement of the creation of the earth before it was formless and void (1:2). Moreover, for the author of Genesis, God's existence outside of time and space is simply assumed: God created, but He Himself has no beginning or origin.

Steinmann rightly argues that unless one asserts an unmentioned (and therefore unlikely) gap in time between the creation of the 'heavens and earth' and God's activity beginning in Genesis 1:3, the creation mentioned in verse 1 is part of the activity that is later summed up by verse 5 as 'one day'. For Steinmann, "In the beginning ..." is a statement that "locates the creation of space, matter and time when God, including the person of the Son of God, already was (John 1:1–3; 17:5, 24)". He rightly rejects the 'liberal' and convoluted rendering "When God first created ... God said ..." and notes that there is little textual support for this.

"Now the Earth ...", in verse 2, focuses the narrative on the—at this point—"formless and void" earth. The 'deep' (*tēhôm*) signifies the primeval ocean that covers the earth. Steinmann rejects the view that, because *tēhôm* shares a common Semitic root with *Tiamat* (a pagan God), Genesis was derived from, or dependent on, the *Enuma elish*, the Babylonian pagan creation myth.

In verse 3, "God said ..." signifies the power of God "to simply speak things into existence" (cf. 2 Corinthians 4:6; Hebrews 11:3; 2 Peter 3:5). The creation of light precedes the creation of the sun, moon, and stars, and although the source of light is not

explicitly stated, the scriptures elsewhere suggest that God himself, the second Person of the Trinity, will be the source (John 1:1–5; Revelation 22:5).

Steinmann argues the first day's length is summarized by the statement "there was evening and there was morning", which he contends may be better understood as "In summary, there was evening, then there was morning". The evening and morning are then said to make one day. He adds that in most Bible versions this is translated as 'the first day'. "However", he says, "the Hebrew text contains no article ('the'), and the number is 'one' not 'first'. The beginning of the day is reckoned from evening. This would dictate the way sacred days were celebrated in Israel (Exo. 12:6; Lev. 23:5, 32; Neh. 13:19)" (p. 52).¹

A second day

God divides the waters of the deep and creates the 'expanse' (Heb. *raqia*), which Steinmann identifies as 'the sky' (p. 53). He notes that the meaning of the verb form (*raqa*) is 'stretch out' or 'spread out' and is used elsewhere of God spreading out the heavens and the earth (Psalm 136:6; Isaiah 42:5; 44:24). The verb is also used in Job 37:18 to describe God's spreading out the clouds. Thus, Steinmann identifies the expanse as the sky, the upper waters as the clouds, and the waters below as the seas.

However, like many commentators on this part of Genesis 1, Steinmann focuses too much on 'the waters' rather than on what was actually created on this day: the expanse!

A fourth day

Steinmann contends that the narrative for the fourth day has a "strong anti-mythological" and "anti-polytheistic" cast to it. "The sun, moon, and stars are creations of the one God, not gods to be worshipped" (p. 54). Indeed, God assigned functions to

them (Acts 14:15; 17:24), so they are not self-actualizing and autonomous gods.

The sixth day

Steinmann acknowledges God's utterance, "Let us create ... Our image ... Our likeness" has been the subject of much theological discussion. According to Steinmann, a common theory is that this includes the angels or the 'heavenly court', despite humans not being depicted as sharing an angelic image anywhere in Scripture. Another theory is that the plural depicts God's majesty, but this is without grammatical support because the so-called 'plural of majesty' does not exist in biblical Hebrew verbs. Another view is that the plural depicts God's self-deliberation, but this use cannot be demonstrated elsewhere in the Old Testament. However, as Steinmann points out, the text (see the mention of the Spirit in verse 2) clearly depicts God as "an inward plurality and outwardly singular". Steinmann adds that although this phrasing has been understood to be a reference to the Trinity, the notion of one God in three persons is only implicit here at best.

In any case, although the human beings God creates possess His image, they are not God—as the events of Genesis 3 amply demonstrate. Nevertheless, humans display God's image by ruling over the animals created on Days 5 and 6.

Steinmann notes that the repeated chronological summary formula "Then there was evening and then there was morning" emphasizes the conclusion of all of God's creative activity; but in this instance, the definite article precedes the ordinal 'sixth', indicating the correct translation as being "a day, the sixth one".

The seventh day

For Steinmann, the lack of the evening and morning refrain at the end

of this day signifies a literary device that sets the seventh day apart and emphasizes its holiness. Indeed, the term ‘the seventh day’ occurs three times in Genesis 2:2–3 to denote three activities of God. Firstly, God completed His work on the seventh day. Secondly, God rested on the seventh day. Steinmann rightly notes that the Hebrew word can mean ‘to cease’ and, in this instance, denotes a cessation of God’s creative work. Finally, God blessed the seventh day and declared it to be holy because on that day He ceased His creative work. And, as Steinmann points out, God did not cease all work, only His creative work.

Interpretations of Genesis

The Framework Hypothesis

Regarding the so-called ‘framework hypothesis’—the view that the days of creation are merely a literary device consisting of two parallel sets of three days, and therefore not intended to be understood literally—Steinmann argues that it draws a false distinction between the literary aspects of the text and its chronological features—as if they are mutually exclusive.⁵

Analogical Day View

On the Analogical Day View (championed by C. John Collins), Steinmann points out the obvious flaw with this approach: that later references in the Scriptures refer to the events of creation as real and historical. There are no references to the Creation Week being ‘like six days’ followed by a sabbath. Rather, they state that the Israelites are to work for six days and then rest on the sabbath, because God performed His work of creation in six days and then rested on the seventh day (Exodus 20:11; 31:17). Moreover, in these verses the causal relationship runs in the opposite direction to what

the advocates’ analogy requires: “the Israelite seven-day working week is compared to God’s work of creation, not vice versa” (p. 60).

Note also that the references to the Sabbath Year make no mention of the Creation Week (Leviticus 25:1–6, 20–22; Deuteronomy 15:1–3; 31:10–13). Yet, if the Creation Week is an analogy, why does it not apply to the sabbath year?

Literary Day View

For Steinmann, Genesis 1 presents a view of creation that is contrary to the primary assumptions and beliefs of other ancient Near Eastern cosmologies from Mesopotamia and Egypt: Genesis is strictly monotheistic rather than polytheistic; and Genesis does not present its actors as autonomous gods, but as subject to the will and power of the Creator. Moreover, that Genesis alone reports God’s creative work occurring over a number of days should not be lightly dismissed.

Steinmann rightly argues that there are compelling reasons for understanding Genesis 1:1–31 to be “depicting six actual, regular days” (p. 61). All six days include the passing of both evening and morning, and the

references to days and years on the fourth day (v. 14) clearly refer to literal days and years. The regulations for the sabbath day (Exodus 20:11; 31:17) are based on the pattern of God’s work during Creation Week, without any indication that the creation days are anything other than ordinary days. Thus, Steinmann follows the conclusion of 4th-century Church Father Basil the Great (figure 3):

“And the evening and the morning were one day. Why do Scriptures say ‘one day’ not ‘the first day’? Before speaking to us of the second, the third, and the fourth days, would it not have been more natural to call that one the first which began the series? If it therefore says ‘one day’, it is from a wish to determine the measure of day and night, and to combine the time that they contain. Now twenty-four hours fill up space of one day—we mean of a day and of a night ... It is as though it said: twenty-four hours measure the space of a day, or that, in reality, a day is the time that the heavens starting from one point take to return there. Thus, every time that, in the revolution of the sun, evening and morning occupy the world, their periodical succession never exceeds the space of one day” (pp. 61–62).

Genesis 2

The Tree of the Knowledge of Good and Evil has been the subject of much speculation. But according to Steinmann, the term ‘Good and Evil’ is often used to denote the ability to decide or determine what is acceptable or unacceptable, legally correct or incorrect, and the fruit of this tree probably bestowed the proclivity to depend on oneself rather than God.

On Adam’s need for a helper, Steinmann points out that the word translated ‘helper’ (*ezer*) does not imply inferiority. Indeed, God is often called



Figure 3. Steinmann follows the conclusion of 4th-century Church Father Basil the Great.

a ‘helper’ for humans (Exodus 18:4; Psalm 10:14; 27:9; 40:17; 118:7).

Furthermore, Steinmann emphasizes that marriage is intended to be permanent. Genesis presents marriage as a divine gift to humankind intended to benefit the entire earth with its plants and animals, and thus, “marriage is not merely a humanly devised convention to be changed or adapted to new circumstances or conceptions of human sexuality” (p. 68).

The Curse and Redemption

Steinmann rightly rejects the view that the Fall is some kind of parable or myth, noting that the New Testament treats Adam and Eve as real historical people. Indeed, Jesus, the last Adam, whose life, death, and Resurrection reversed the curse on Adam, is a descendant of the first man, Adam (Luke 3:23–38). And as Paul states, sin came into the world through one man, and death came as a result of sin (Romans 5:12).

Although the curse on the serpent is usually understood as God transforming him to move on his belly, Steinmann points out that the other judgments of God did not transform the basic nature of either the woman or the man. The woman was always the one to bear children through labour and the man was always intended to labour in the fields. Therefore, Steinmann contends that it is unlikely that the Curse transformed the movement of snakes, but, rather, their movement was subjected to futility in that the serpent will now ingest dust—the raw material that was used to make Adam and that will be left as a result of human death.

By restricting their access to the Tree of Life and banishing them from the garden, God prevents humans from living forever in a permanent state of estrangement from their Creator. Since God is the source of life, restricting access to the Tree of Life also restricted access to eternal communion with

God. All human beings, even the most pious, are infected by sin and subject to its effects. Yet God promised a “seed of the woman” who would overcome the serpent. The good news is that this seed has already conquered death and overcome evil: through Christ we may have our relationship with God restored (Romans 5:1–2; Ephesians 3:10–12). Therefore, Genesis 3:1–24 is not simply about the effects of sin but also about the love, compassion, and grace of God.

The Flood

Surprisingly, Steinmann makes no explicit statement regarding the extent of the Flood or whether it was local or global. This may be because he believes it was clearly global and there is no need to state the obvious. Indeed, his general comments do indicate a belief in a global Flood.

For instance, Steinmann notes that the last use of the term ‘flood’ occurs with the notice of the rising waters during the 40 days of rain that lifted the Ark to float above the mountains (vv. 17–19). He comments:

“The waters are said to have been 15 cubits above the mountains. Since the Ark was 30 cubits high, this probably indicates that the ark’s draft was 15 cubits (v. 20). Thus, the water rose high enough to lift the ark at least 15 cubits over the highest peak ... While the faithful Noah survived with all the life on the Ark, the rest of the world perished (7:21–23). Even the earth’s animals, which are amoral creatures, incapable of sin against God, were affected by the consequences of the tide of sin which had overwhelmed the earth.”

Summary

Steinmann’s commentary is an order of magnitude better than Derek Kidner’s previous volume on Genesis

in this series. It contains clear and generally accurate historical and theological explanations of the book of Genesis. This is the purpose and goal of the *Tyndale Old Testament Commentary* series. Although the author often makes reference to Hebrew words and other ancient Near Eastern cognates, you will not find technical discussions of Hebrew grammar and linguistics. What you will find is a concise, reliable commentary on the text of Genesis that is also accessible to the busy pastor and preaching layman.

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4. See especially Henri Blocher (*In the Beginning*, translated by Preston, D.G., IVP, Leicester, 1984) and Meredith Kline (Space and time in the Genesis cosmogony, *Perspectives on Science and the Christian Faith* 48(1), March 1996).
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Creation Week, mature creation, and natural processes?

Creation Unfolding: A new perspective on Ex Nihilo

K.P. Coulson

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Shaun Doyle

God made the world and everything in it in six consecutive ~24-hour days. The Scriptures are clear and emphatic on this—especially what God wrote with His finger in Exodus 20:8–11. But what exactly happened during Creation Week? Can we use science to show that what God made during Creation Week was made recently? Or do we need to appeal to some sort of ‘apparent age’ apologetic? Or perhaps we should just be satisfied with calling it a miracle, and leaving it at that?

The question of how science and natural processes interface with the creation miracle raises a lot of important issues in the origins debate. Ken Coulson, a Ph.D. creation geologist (from Loma Linda University, specializing in Cambrian microbialite formations) has written *Creation Unfolding: A New Perspective on Ex Nihilo* to address these questions.

What’s the problem with YEC approaches to Creation Week?

In explaining the origin of things in Creation Week, “God spoke, and it happened” is a fair answer, as far as it goes. It was clearly a miracle. However, young-earth creationists

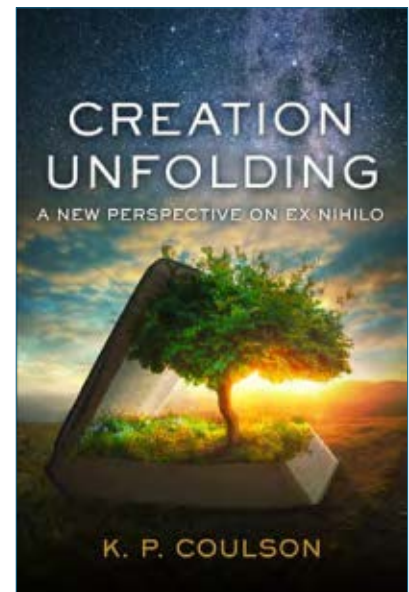
typically don’t leave the answer there. The world is full of process, which we study through science. How do we interface that with Creation Week?

Coulson sees “some glaring problems within mainstream young-Earth creationism [YEC] that stem from what I believe is an overly suspicious approach to conventional science”. YEC websites run by people with little or no scientific or theological expertise have promoted the misguided belief that “a YEC interpretation of nature is *obvious*, and only a fool would fall for the secular view that believes the Earth is 4.6 billion years old.” This has incited evangelicals in the church at large to say things like, “there is not a shred of evidence in support of an evolving universe,” or “how could anyone believe in millions of years of Earth history?” Put simply: science *proves* the young age of the earth and universe, and it’s only the foolish naturalistic bias that blinds the scientific establishment to the obvious.

However, there are processes at play in creation that we know can form much of what we see, *given enough time*. But to do so they would require far more time than Creation Week allows. As Coulson explains:

“As we shall see, there are many aspects of creation that, without deferring to special revelation, *will only lead* to an evolutionary and/or old-Earth perspective.”

For instance, Coulson cites the example that new continental crust is being formed at a certain rate per year through processes we see happening today (figure 1). But if we extrapolate those processes back at the rates we currently observe, they would give an



age for the crust much older than the Bible allows for. And yet, geophysicists can successfully predict the composition of the continental crust by assuming it formed through those natural processes. The geophysics of continental crust formation is *successful* science, both as operational science *and* historical science. So, if natural processes suffice to create the continental crust, and the rates of the natural processes through which it forms indicate a million/billion-year age, where is there room for supernatural creation?

When a Christian geologist or geophysicist sees this, how does he respond? How can he integrate what he knows from the Bible, that God created the world in six days, with the success of his scientific discipline in predicting so much about the nature, history, and origin of Earth’s interior by the operation of natural processes? This is the question that drives Coulson’s book:

“This book presents a scientific and theological synthesis that both affirms a six calendar-day creation while at the same time providing a solid scientific methodology from which the Christian layperson, educator, and scientist can approach the origin of the universe.”

A new mature creation apologetic

Coulson says there is only one way to deal with this:

“The presence of vast processes in conjunction with short time frames can, therefore, only be understood by appealing to some kind of mature creation apologetic.”

But, what sort of “mature creation apologetic”? There have been different forms since they first arose in the 19th century, largely in response to the growing acceptance of deep time geology. Coulson surveys their history, starting with scriptural geologist Granville Penn and the *Omphalos* theory of Philip Gosse. He then highlights the approaches of Henry Morris and Ken Ham, which were much more modest approaches than Gosse. Morris allowed for apparent history in inorganic traces (such as radioisotope abundances and starlight from distant stars) but rejected the application of apparent history after Creation Week or to explain the fossil record, which he (rightly) held to be inconsistent with a ‘very good’ pre-Fall world. Ham, however, had the ‘thinnest’ form of mature creation, embracing ‘functional maturity’—‘apparent history’ only so far as needed for the immediate function of the biosphere.

Coulson then identifies what he regards as the main objection to mature creation apologetics: what has been dubbed ‘non-essential apparent age’.¹ For instance, SN1987A:

“Why would God create in-transit starlight representative of a fake supernova that itself becomes manifest only thousands of years later, and then only for a few months before fading into the stellar background? It seems fair to say that SN1987A and its related cosmological phenomena do not seem to be required for the immediate functionality of a mature universe”.

Coulson suggests compartmentalizing matters. Consider Adam’s skin.

Coulson suggests it was rapidly ‘aged’ in anticipation of the natural laws and conditions that would naturally age human skin to match his functional ‘age’ (of a 20–30 year old). In that case, it would have freckles, blemishes, and even wrinkles. But it would of course have been the skin of a *perfectly healthy* young man; no scars or defects that would affect the function of the skin. As an analogy, he considers Moses’ snake (Exodus 4:3). Was it genetically perfect without defect or signs of aging? Probably not. It was probably a snake the Egyptians would’ve recognized. In other words, it was made *in anticipation of the conditions it would be exposed to*. Which means it would’ve looked like an ordinary snake—mature, healthy, *and* with phenomena consistent with a fallen world. But is that deceptive? Coulson thinks not. Rather, it goes back to purpose: what was the snake made *for*? To convince the Egyptians that God was the true Creator. The message was thus something recognizable to the audience.

In fact, Coulson says the removal of such age and growth-process phenomena (e.g. tree rings) has problems of its own:

“An across-the-board, blanket-like removal of all such age and growth-related phenomena by God during Creation Week would change the very way nature was supposed to look, grow, feel and sound Such an anomaly would also make it difficult, if not impossible, for man to complete his God-given mandate to have dominion over the entire Earth. To have dominion over something means to *understand* how it works. If Adam suddenly decided to dump his newly acquired theological training in exchange for a career in paleontology, archaeology or osteology, he would soon find himself up against some contradictory and anachronistic data.”

In truth, though, Coulson offers a slightly different approach. He seeks to avoid the language of ‘mature creation’, ‘appearance of age’, and ‘apparent

history’. For him, the problem is that these speak in static terms to describe *dynamic* events. They focus only on the effect and ignore the cause. To do this, Coulson suggests two concepts: *supernatural formative processes* (SFPs) and a *conceptual universe*, which he spends the next four chapters elucidating. With these, he believes he has found a way for mature creation apologetics to interface fruitfully with secular geophysics and astronomy while remaining faithful to the biblical text.

One of the weaknesses of traditional mature creation apologetics is its lack of attention to the *processes* that govern creation. Plus, God appears to have supernaturally formed at least some things through processes during Creation Week, such as the land appearing out of the waters below and the vegetation sprouting on Day 3. But how did God govern those SFPs? Coulson uses examples of post-Creation Week miracles as a template for understanding Creation Week.

For instance, Jesus turned water into wine. If it were submitted to scientific analysis, it would’ve reflected the typical natural history for producing wine in that time and place. The same would be true for the almonds that budded from Aaron’s staff and the snake that formed from Moses’ staff. Jesus Himself was unremarkable in appearance—an ordinary-looking human. And, of course, Jesus created bread and fish more than once, which would’ve reflected the specimens of each recognizable to the locals. In each case, Coulson argues that “God’s supernatural creative strategy involved a *commitment to existing natural processes*.”

Coulson also points out that, in all these cases, a commitment to science as the only way to know things would lead us to *wrong* conclusions. The physical characteristics of Aaron’s almonds, Moses’ snake, Jesus’ DNA, and the bread, fish, and wine he made would all lead us to *inevitably* conclude that they formed through natural processes. After all, experience teaches us that time-dependent processes are

needed for these things to come into existence. But this would be wrong. When God says He created something supernaturally, we're no longer given the option to interpret its origin in terms of natural processes. If we try, we *will* conclude a false origin.

But Coulson argues this approach can be pushed back into Creation Week as well. For instance, Snelling has suggested that kilometre-thick strata were deposited on Day 3 as the land appeared out of the water.² Faulkner has suggested that cratering occurred rapidly for the moon on Day 4.³

These clearly must be *accelerated* processes; a rapid *maturing* of the elements under consideration *from an undeveloped or embryonic state*. But Coulson adds to that the notion of the *constancy of relative rates of process*. For instance, if two plants grew at different rates relative to each other, God would've sped them up *so that their rates of growth remained the same relative to each other*. This would create a sort of 'time lapse' effect. Plants would all grow normally *relative to each other*, but the system *as a whole* would be sped up. Indeed, in rapidly *maturing* the plant world like this, some plants may have gone through cycles of life and death. That may even be crucial

for establishing a *functional* plant ecosystem. We can call this the *time-lapse creation* model (figure 2).

Coulson then applies this to geology. The land *appeared out of the sea* on Day 3. Several creationists have noted this, and posited *catastrophic* explanations for the Precambrian rock relationships akin to Noah's Flood (indeed, even larger!). However, Coulson points out a problem for this interpretation: stromatolites are present all over the world throughout much of the Precambrian record. They are mound-like structures that typically accrete because of the work of photosynthetic bacteria. However, there are many stromatolite horizons in some of the earliest rocks on Earth to form. But that would imply that communities of cyanobacteria grew and died multiple times, and thus, under ordinary circumstances, it would have required substantial time to form. Moreover, a catastrophic upheaval of the land would create conditions inimical to the formation of stromatolites. Coulson explains the import of his solution:

"This might mean that the Day 3 regression of Earth's oceans was not catastrophic at all. Something is geologically catastrophic when a *single rate*, say erosion due to a

flood, is accelerated many times relative to other geologic rates—e.g. deposition of sediment, growth of plants, production of soil. Since *all the rates* were accelerated and remained constant with each other, an observer would witness the development of a genuine, shallow-water environment proceeding at break-neck, yet time-lapsed speed."

However, Coulson says we can't apply SFP theory to arrive at anything empirically consistent with big bang history of the universe. In the Bible, the earth was made on Day 1 and the celestial objects on Day 4. The big bang history says the sun and most of the stars were formed before the earth. To address this issue, Coulson introduces his 'conceptual universe' idea: "a fully functional, conceptual universe, already 'existed' *in the mind of God* prior to Genesis 1:1."

In essence, Coulson posits that God had a whole maturation process for the universe *in His mind* before Genesis 1:1. However, when God manifested the physical product, He didn't manifest the whole maturation process He had in His mind. Instead, He only manifested the *end product* of the maturation process in His mind. SFP theory still applies in this scenario, since God conceived not simply the final product, but the whole maturation *process*. However, Coulson doesn't require the maturing process *in the universe* to have had a physical manifestation, like he suggests for Earth processes on Day 3. As such, events such as SN1897A occurred *in the mind of God* as part of God *mentally* maturing the universe.

But why create the earth before the sun? Of course, God could've done whatever he wanted; the question is in one sense rather moot. But, Coulson explains:

"Contrary to popular opinion, the pinnacle of God's creation is not the universe, *it is man*. Man is God's creative, crowning glory. In order to underscore this reality, God purposefully placed the planet upon

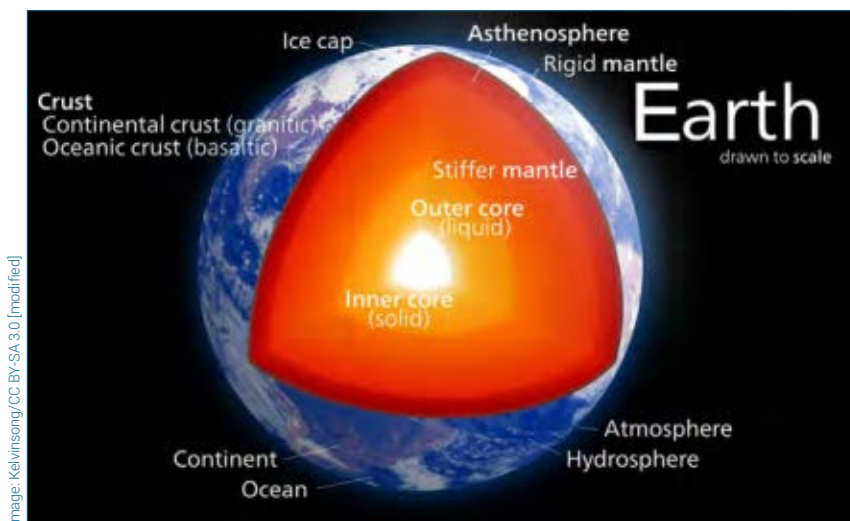


Image: Kelvinson/CC BY-SA 3.0 [modified]

Figure 1. If natural processes successfully describe the evolution of the earth's interior, did God use them in making the earth's interior?

which man would dwell as first in the created order.”

Assessment

So, what are we to make of Coulson’s mature creation perspective? Coulson’s project is an interesting one, and also likely to be quite controversial.

A successful mature creation apologetic?

The crucial question is: does Coulson succeed in overcoming the standard challenges to mature creation apologetics? I think some aspects of his model do this better than others.

Time-lapse creation?

I think the most successful aspect of Coulson’s thesis is his ‘time-lapse creation’ idea. It gives us a reason to affirm the *reality* of large-scale processes during Creation Week, since God basically *accelerated* the maturation *processes* of the various systems He created. On the surface, the only feature of this history that seems ‘apparent’ is the *age*.

However, there is a major challenge for this perspective. How could *seasonal* plants grow all over the earth when they were exposed only to one daylight period and a single day of weather (of whatever season)? Indeed, without any sun? The same problem affects geological processes in Creation Week, with the possible presence of, for example, tidal rhythmites in Precambrian rocks, as well as the need for photoperiodism to explain the existence and growth of stromatolites. It was one day before the existence of the sun and moon; how could many days, months, and years of biological processes happen without photoperiodism and the existence of the sun and moon? This is basically a special instance of the old ‘apparent histories make God a deceiver’ objection. After all, much of how the rocks and plants developed in this scenario occurred

as if, for example, the sun and moon were present, though we know they were not.

I think Coulson’s appeal to the budding of Aaron’s staff in Numbers 17:8 as a template is a good response. The staff budded, blossomed, and produced almonds *in one night*. However, almonds require not simply more time than one night to grow, but also seasonal variations and photoperiodism (as well as soil, a root system, and nutrients). As such, the almonds rapidly matured *as though* all the needed natural conditions were present. Other examples of biblical miracles (such as Jesus’ human body, and the miraculous wine, fish, and bread) would all correspond to this pattern, too.

Applied to the creation of vegetation and the appearance of the land on Day 3 of Creation Week, it would suggest that all the processes involved in the system (including organism growth) were accelerated proportional to each other *and* the organisms grew as though all the needed natural conditions were present.

But how could all this happen in one period of daylight? Coulson has a good answer for this, too: “The periods of day, evening, and morning served to fix the reader’s temporal frame of reference, *not to cause the growth of plants* [or cyanobacteria in stromatolite formations].” The growth of plants was an *inside* consideration for the time-lapsed system, not a concern for the absolute temporal frame of reference.

A conceptual universe?

I think Coulson’s ‘conceptual universe’ idea is more problematic. The biggest problem, I think, revolves around giving a *merely conceptual* maturation process the status of ‘real’. It seems to me implausible, even if God is the one doing the conceptualizing. It blurs the distinction between conceptualization and creation; a distinction we experience every day. Whatever sort of ontological status we give to thoughts and concepts, there is clearly a fundamental lack of concreteness

to them that exists for causal objects such as we see all around us in the physical universe. And this is not to promote materialism, either; God and spiritual agents are just as concrete and causal as the physical world, though we lack any physical sense experience of them (in general). However, to the extent that God’s conceptualization of any sort of maturing cosmos lacks concreteness, it seems it lacks *genuineness* as a process *history*. As such, the spectre of God as a deceiver is not so easy to avoid.

Moreover, I’m not sure how much Coulson needs to rely on the ‘conceptual universe’ idea to achieve his aims. I don’t think it’s needed to make Day 4 work in Coulson’s perspective. All God needs to do is cordon off Earth from any effects of a rapid maturation of the cosmos on Day 4, and such a process can be allowed to proceed in *physical history* and not merely in concept. In this case, SN1987a was thus the product of not just the post–Creation Week history, but that and the *real* maturation of the cosmos on Day 4.⁴ Indeed, Coulson acknowledges this possibility:

“It is true, God could have brought an *immature* universe into our existence, causing it to develop in time and space like the ‘sprouting’ plants and trees of Genesis 1:11–12 or the Earth. ... Doing so, however, doesn’t change the fact that God has every developmental facet of our universe, including its future state, fully planned out in His mind.”

Coulson’s response, though, assumes that God merely having the plan in his mind makes it count as ‘real’. That, however, is precisely the problem—is it ‘real’ if the plan is *just* in God’s mind?

Apologetics, faith, and ambiguity

Coulson thinks we *can’t* prove the universe is young. Indeed, he says God designed things that way: “God’s design is not to prove that the earth or the universe is 6,000 to 10,000 years old.” Instead, he says that God is clear

enough from creation to justifiably condemn us for ignoring general revelation, but ambiguous enough to allow people the freedom to ignore Him. Mature creation and the mismatch of scientific conclusions and scriptural declarations are instances of God veiling Himself.

This is an interesting approach. There is little problem with God inputting some ambiguity into creation. And God does indeed save through the foolishness of the Cross rather than through the mere application of human intellect. Nonetheless, I don't think this provides much support for Coulson's mature creation apologetic.

First, what of Romans 1:19–20? I think Coulson rightly points out that this doesn't have anything to do with proving the world is young: "Psalm 19, 104 and other such passages are mainly concerned with a broad theological fact—God is powerful, and this power is displayed in the created cosmos." Still, if Romans 1:19–20 has nothing to do with proving the earth is young, can we be sure the pattern God used in general revelation applies to scientific process-age arguments? Perhaps God providentially embedded some supernatural signatures in the rocks,

knowing they would only become relevant in modern times, and did so to encourage the faithful and provide a challenge to skeptics.

None of this suggests scientific process-age arguments would ever prove *beyond a shadow of a doubt* that the world is young. But it does attenuate the link between ambiguity in creation and the sort of general mature creation apologetics Coulson advocates. Why? It shows that process-age arguments are also consistent with the balance of ambiguity and clarity God has deployed in general revelation. After all, such process-age arguments have some convincing power, but they are based on large-scale extrapolations, and these, in turn, are based on assumptions. As such, the naturalistic mindset can ignore or sidestep them with auxiliary hypotheses. After all, if they can do it with abiogenesis, they can do it with anomalous process ages in the rocks. At the very least, either approach is justifiable.

Nonetheless, if there is a lot of ambiguity in creation, it may lend more support to the sort of mature creation approach Coulson employs. However, I think Coulson overplays the ambiguity embedded in creation.

He says ambiguity is so pervasive that, despite the fact everyone must exercise some sort of faith, "I do believe it is the Christian who must exercise *more* faith" than the materialist. Is this really consistent with saying that general revelation is clear enough in what it reveals about God to hold everyone accountable for ignoring or rejecting God? It doesn't seem so. Plus, I don't think God's ambiguity in creation is that severe. If it were, materialism and atheism would have been broadly popular views throughout history. And yet Isaac Newton, only 300 years ago, quite justifiably said this: "Atheism is so senseless and odious to mankind that it never had many professors."⁵ We can acknowledge that it's much easier *today in the West* than it ever has been elsewhere to be an atheist or materialist. But that suggests the issue is not something intrinsic in faith or general revelation, but rests largely in the particulars of our culture and recent history.⁶

Two approaches?

This brings us to two ways to view Creation Week, as Coulson observes. He says it revolves around the question: is there an apparent age for the Earth (and universe)? He outlines the implications of each idea:

"1. If there is *no* apparent age for the Earth, this would mean that various processes *currently* at work within the earth cannot be extrapolated backwards in time for the purpose of determining a 'beginning'. In this scenario, some of the Earth's *internal* processes can be extrapolated backwards millions or billions of years (partial melting, fractionation, gravitational differentiation, radioisotope decay), others can be extrapolated backwards hundreds of thousands or even thousands of years (the decay of the earth's magnetic field), while others cannot even be correlated at all, since they were clearly supernatural acts (polonium halos). This would mean that



Figure 2. Coulson's 'time lapse creation' has God hitting 'fast forward' on natural processes to produce the land and plants on Day 3 of Creation Week.

God used other, as yet unknown, mechanisms in conjunction with known processes when forming the planet.

“2. If there *is* an ‘apparent age’ of the earth, this would mean that various processes at work within the earth *can* be extrapolated backwards in time for the purpose of determining a ‘beginning’. In this scenario, *all* the earth’s internal processes can be extrapolated backwards into Creation Week because, although these processes were accelerated, they were operating at the same rates, *relative to each other*, as they do in the present (SFP theory).”

Coulson favours the latter approach, and I think he has laid out its strengths relatively well. However, I think he misconstrues the true strength of the ‘no apparent age’ (NAA) approach.

Coulson says:

“Choosing the first option has the benefit of underscoring a few processes for the purpose of ‘proving’ that the Earth’s *internal* structure was supernaturally created about 6,000 to 10,000 years ago.”

For instance, the magnetic field of the earth seems to match the c.-6,000-year timescale of the Bible and is therefore *positive scientific support* for the biblical timescale.

However, if the earth has no apparent age, the existence of processes that roughly match the biblical timescale is *inconsequential* for its reasonableness. Instead, it’s what Coulson thinks the proponent of this approach must *admit* that is the true *strength* of this approach:

“This means scientists cannot rely on *current natural* rates for the purpose of understanding anything that was made during Creation Week.”

The advantage of this approach is that, if true, it reveals the futility of trying to form a comprehensively cogent naturalistic account for the history of the universe. Since different processes give different process ages, how could such a system have formed

naturalistically? The resulting conditions are complex in very specific ways; ways that would be too improbable for it to have formed spontaneously within the history of the observable universe. But such conditions are only ever associated with intelligent activity. In other words, anomalous processes with a system are an argument for *intelligent design* (or supernatural creation).⁷

But does this make the NAA approach better than the AA approach? Not necessarily.

First, what of those supposedly ‘discrepant’ process ages? Some seem more secure than others. But we run into a serious problem of underdetermination: i.e. the physical data seems open to multiple conflicting, yet empirically equivalent, interpretations. The data by itself is rarely, if ever, enough to justify belief in one interpretation of the evidence over all others. Indeed, perhaps the starkest examples of underdetermination among scientific disciplines concern the historical sciences of the deep past. After all, think about the million-fold or more extrapolations that are required to obtain process ages! Are we sure that nothing happened in between now and when the system started ‘ticking’ to affect the ‘age’ the system gives? And what of the radical ‘gappiness’ of the rock record—it is more gap than record at *multiple different scales*!⁸ These issues are a major problem even *after* Creation Week, but they become unavoidable *during* Creation Week.

As such, there *are* scientific reasons to adopt the NAA approach, but they are not so epistemically secure as to rule out the AA approach. The AA approach also has several scientific and theological advantages, as Coulson points out. In other words, there is enough ambiguity in the data *and* the theology for creationists to develop *both* approaches.

I think this is a good thing. It forces us to be tentative about our conclusions in favour of our preferred approach and flexible in our apologetic strategy. For those who feel the weight of

the concerns that motivate Coulson, his ‘apparent age’ approach provides a fruitful way forward. For creationists who are more skeptical of secular science’s ability to understand the history of the cosmos, and those who think there are genuine process-age discrepancies, there is a fruitful way forward. Most importantly, though, this flexibility emphasizes that our approach is founded on *Scripture* rather than our scientific extrapolations and theological implications.

Conclusions

Coulson has presented an interesting case for a mature creation apologetic. It is wide-ranging, well thought out, and achieves many of its aims. There are, however, some important weaknesses, neither is it the only viable approach. Indeed, a variety of approaches is justifiable and healthy. Nonetheless, I think Coulson has presented a useful scientific/theological synthesis for understanding Creation Week. I look forward to seeing it developed further.

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History of biology with unsubstantiated tributes to evolution

Some Assembly Required: Decoding four billion years of life, from ancient fossils to DNA

Neil Shubin

Oneworld Publications, 2021

Joel Tay

Neil Shubin is a well-known evolutionary biologist from the University of Chicago and Provost of the Field Museum of Natural History. He is most well-known for his discovery of *Tiktaalik roseae*, one of the supposed evolutionary intermediates between fish and land creatures (figure 1). In *Some Assembly Required*, Shubin takes his readers down memory lane to celebrate some of the most exciting scientific discoveries in paleontology and genetics. The book is essentially a collection of short stories that span the history of genetics. Shubin writes in an engaging narrative style that is informative, yet accessible to the layperson. Readers with a background in molecular biology or genetics will already be familiar with most of the things mentioned here.

The book excels whenever it sticks to history, but falters whenever it tries to extrapolate the scientific discoveries as if they are all proof of evolution. Knowledgeable creationists will agree with many of the scientific discoveries mentioned in the book yet recognize that these do not support evolutionary theory. More concerning, however, is that many of his arguments

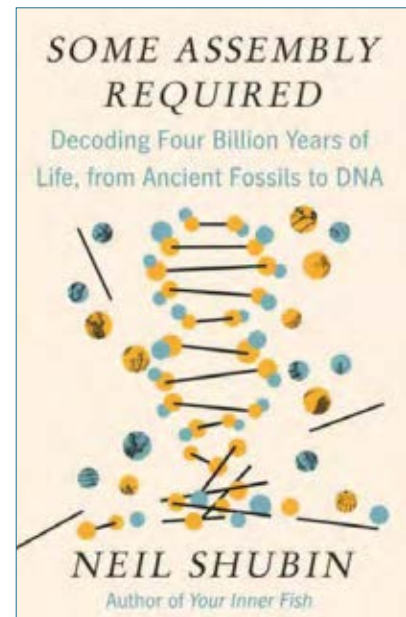
for evolution are outdated and already refuted in the literature.

Tiktaalik

Neil Shubin starts the book with a retelling of his call to fame. He talks about his graduate days and the eventual discovery of *Tiktaalik* (figure 2). Shubin appeals to homology. He explains how the same genes involved in swim bladders in fish are also involved in the development of lungs. Likewise, he appeals to homology in the fins and tetrapod limbs as evidence that fins evolved into limbs. However, creationists have often pointed out that creatures such as mudskippers and lungfish require a whole host of specialized anatomy for them to adapt to life on land—lungs alone are insufficient. Thus, mudskippers and lungfish exhibit the hallmarks of a well-designed creation, not evolution.¹ Homology is also best explained as evidence for a common designer.

Both creationists and evolutionists agree that swim bladders and lungs develop from the same basic tissue. In evolutionary terms, this is viewed as evidence for common ancestry. On the other hand, creationists see this as evidence for a common designer using variations of the same basic bauplan (body plan) to create different creatures. It is no surprise that the same basic archetypal structures would require the same genes. But if the evidence is consistent with both creationary and evolutionary models, how can it be ‘proof’ for evolution?

Joachim Vetter, in his review of Shubin’s earlier books, points out that



many ‘higher’ bony fish (the teleosts) and electric fish have lungs: “Lungs appear to be much more ‘ancient’ than swim-bladders, so by this reasoning, lungs must have evolved into swim-bladders!”² Vetter goes on to explain:

“... there is evidence that the most ancient (according to evolutionary tenets) placoderm fishes already had functioning lungs, which would mean that all ‘primitive’ jawed fish had them. ... In spite of the fact that lungs are not needed for survival (fish being able to cope well with gills) they appear and are prevalent among fishes at least 100 million years [Ma] (on the alleged evolutionary time-scale) before their (imaginary) migration to the land.”

Now, this turns Shubin’s swim-bladder-to-lungs hypothesis on its head, but he doesn’t tell his readers this.

Shubin admits that some of the earliest fish in the fossil record have lungs. He argues that fish had already evolved lungs before *Tiktaalik*, and all it takes are slight changes in the function of existing organs for sea creatures to become adapted to a terrestrial lifestyle. However, *Tiktaalik* not only has structures more primitive than its

evolutionary predecessors, but four-legged land creatures (tetrapods) had already existed at least 18 Ma in the evolutionary timescale before *Tiktaalik*—so why should *Tiktaalik* be considered a transitional tetrapod?³

Shubin never addresses these problems. Instead, he acknowledges that since his discovery of *Tiktaalik* decades ago, our knowledge of genetics has advanced greatly. If paleontologists today want to remain relevant, they must keep themselves up to date with the latest technological advances in genomics.

From here, Shubin takes us on a journey from paleontological discoveries of the 19th century to modern-day genetics. He goes from George Mivart's opposition to Charles Darwin to Thomas Huxley's controversial claim that *Archaeopteryx* was an intermediate between reptiles and birds. The book quickly transitions from paleontological discoveries to focus on genomics in more recent years. It is a collection of short historical accounts, all attributed to the advancement of evolutionary biology, regardless of whether or not the discoveries had anything to do with evolution. The same usual 'evolutionary' stories found in most evolutionary books are retold here: Hox genes, sonic hedgehog genes, axolotls and salamanders, stickleback fish, neonate chimpanzees, the discovery of DNA, endogenous retrovirus, junk DNA, etc.

There are slight historical inaccuracies throughout the book which the keen reader would pick up. For example, if Shubin were more careful, he would have mentioned that it was actually the embryologist and anatomist Gegenbaur who compared *Archaeopteryx* to *Compsognathus* and first proposed that birds evolved from dinosaurs in 1864, four years before Thomas Huxley. Most of these historical details are minor and do not have a major impact on the book.

Most of the genomic discoveries mentioned in the book are neutral in the sense that they neither directly support nor refute evolution. Nevertheless, these are included as one of the many historical accounts covered in the book. Every scientific discovery is attributed to the advancement of evolutionary biology, even if most of the discoveries have little to do with evolution.

These aspects are interesting for those new to the subject. For example, Shubin discusses the axolotl and salamander. The amount of water the salamander grows in affects the level of thyroid hormones that its body produces. Thyroid hormones, in turn, control the metamorphosis of the axolotl. His point is that changes in development can produce coordinated modifications in the entire body. A lack of, or insensitivity to, thyroid hormones can result in the salamander keeping a lot of its larval features into adulthood. In salamanders this may result in the retention of external gills, limbs with fewer fingers and toes, an aquatic tail, and/or the failure to reconfigure their skulls, gills, and circulatory system.

Outdated evolutionary arguments

However, significant problems arise whenever Shubin tries to address arguments associated with evolutionary biology. Many of his claims are unfortunately filled with outdated arguments for evolution.

Phylogenetic conflict

Shubin speaks of how protein and DNA sequences in both humans and chimpanzees are identical and that genetic similarity matches evolutionary phylogenetic trees very well. While it is a common argument by many evolutionists, this is demonstrably false. The actual evidence flies in the face of evolutionary expectations. Different genes and proteins generate different phylogenetic trees, and "phylogenetic conflict seems to be greatest precisely in genes associated with the appearance of new types of organisms in the history of life."⁴

Chimps and humans

Shubin also pushes the (now defunct) argument that chimpanzees and



Figure 1. Neil Shubin with a cast of *Tiktaalik*

Image: Caleb Long CC BY-SA 1.0



Figure 2. Reconstruction of *Tiktaalik*

humans are 95–98% similar. Again, this is an outdated argument, and this is only true when comparing parts of the DNA that are already known to be similar. If one compares the whole genome, the similarity is less than 85%, a difference of more than ~450 million base pairs. This is highly problematic for evolution since most evolutionists believe that the last common ancestor between chimpanzees and humans lived around 7–13 Ma ago.

Retroviruses and junk DNA

Shubin repeats the evolutionary argument that 10% of our DNA is made up of ancient viruses, 60% is made up of repeated elements from jumping genes gone wild, and that only 2% is made up of our own genes (p. 217).

He argues that HIV is similar to the activity-regulated cytoskeleton-associated protein (*Arc*). The *Arc* protein is associated with memory function. He claims that *Arc* is only found in land-living animals but not in fish. He believes that 375 Ma ago, a virus infected the common ancestor of all land-living creatures, probably a close relative of *Tiktaalik*. When this viral *Arc* gene was inserted into the fish's genome, it made the *Arc* protein active in brains. From there, the viral genome became domesticated to produce new functions for our brains (p. 165). Shubin claims that our ability to read, write, and recall memories all

came about through this ancient viral infection.

However, *Arc* proteins are known to also form capsid-like structures in fruit flies. They play a significant role in trans-synaptic mRNA transport. *Arc* proteins bind to *dArc1* mRNA and transport the mRNA from motor neurons to muscles. So, far from being an incidental viral infection, the *Arc* gene serves an important function as part of a larger complex delivery system. In other words, their presence cannot be explained as a chance insertion in the genome by viruses.⁵

Assuming that *Arc* proteins are evidence that viruses have contributed much to the evolution of life on Earth, Shubin asserts that most of our DNA consists of a graveyard of past viral infections and repeats caused by jumping genes gone wild. Mutations in these stretches of DNA allow for the formation of new genetic information for evolution. Again, these are all outdated arguments. For example, it is widely recognized that mutations in the gene coding for *Arc* proteins are associated with autism and schizophrenia. These are not functionless stretches of DNA. Much of what was previously considered 'junk' DNA is now known to be functional, and mutations in these so-called junk regions are often associated with various diseases.⁶

Conclusion

Neil Shubin writes in an engaging narrative style that takes his readers on a historical tour of paleontological and genetic discoveries. The book is written for the layperson and will serve as a helpful introduction to genomic discoveries in the last few decades. Unfortunately, everything from the discovery of DNA to salamander development to the discovery of CRISPR-Cas9 is described as part of the journey that allows us to understand evolutionary history. Throughout the book, I was looking forward to seeing what new

arguments the author has for evolution, half expecting his lynchpin argument to be at the end of the book. However, I came to the end only to realize that there is little that is new in this book. Much of it consists of the same evolutionary themes that other similar evolutionary books have been telling for years, including many outdated arguments. The book comes across as a collection of short stories, struggling to sum it all up at the end. While it reads smoothly, it ends somewhat abruptly. I can't help but feel that this is far from Shubin's best work.

The thesis of the book is that paleontologists today must keep up with advances in genomics if they want to remain relevant. Yet Shubin is guilty of using outdated arguments from genetics in his bid to promote evolution. The irony is unfortunately lost on him.

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Candidate site for Noah's Ark, altar, and tomb

Ken Griffith & Darrell K. White

While researching a Babel candidate site near Diyarbakir, Turkey, on 3 October 2019, we found a complex of sites on the mountain Karaca Dag that, upon further examination, seem to match the description of the landing site of Noah's Ark, along with a tomb, possible altar, and much more. The tomb is a 60-m-square, rough stone mastaba, oriented to the winter solstice sunrise, with two extensions that make it into roughly a 160-m-long boat shape. The site is marked by six or more geoglyphs, situated along an arc 5 km distant on the northwest side of the mountain. The possible remains of the Ark appear to have had a modern school built on them, now collapsed.

We would expect to find the landing site of the Ark near the centre of the oldest post-diluvial distribution of humans and domesticated plants. The site presented in this paper lies upon a mountain between the Tigris and Euphrates Rivers at the centre of the Pre-Pottery Neolithic A (PPNA) Culture.

This mountain, Karaca Dag, is where the genetic ancestor of all domesticated Einkorn wheat was found by the Max Planck Institute.¹ The other seven founder crops of the Neolithic Revolution all have this mountain near the centre of their wild range.² This was so exciting that even the LA Times remarked how unusual it is that all of the early agriculture crops appear to have been domesticated in the same location:

"The researchers reported that the wheat was first cultivated near the Karacadag Mountains in south-eastern Turkey, where chickpeas and bitter vetch also originated. Bread wheat—the most valuable single crop in the modern world—grapes and olives were domesticated nearby, as were sheep, pigs, goats and cattle."³

If this site is what we suspect it to be, then the Ark itself has long ago rotted away, leaving nothing but a long patch of gravel ballast and perhaps some broken pottery. Coordinates: 37°42'45.76"N 39°49'57.68"E

Upon the gravel patch a school for shepherd children was built in 1928, now collapsed.

The adjacent stone tomb appears unscathed. Further away on the slopes of the mountain several geoglyphs mark the site. Two of them appear to contain writing in an unknown script.

In addition to the geoglyphs there is evidence of ancient human habitation, farming, roads, and terraces on both ends of the mountain, 10 km north and south of the tomb and Ark site.

We will also review evidence that the site was desecrated in ancient times, making us less surprised to see recent desecrations.

Criteria

Ark searchers have claimed to find petrified wood^{4,5} or a frozen, intact wooden structure above the permanent snow-line.⁶ Unless it landed at an elevation above 3,000 m, we expect any wood to have rotted away long ago.

Low value imperishable materials might survive. Considering that the Ark carried a large cargo of relatively low-density food stuff such as hay, it seems likely that it would have required ballast to ride low enough in the water. Any ballast is likely to still be there in the footprint of the vessel. We would expect to find a foreign patch of gravel, sand, or stones.

Food stores in the Ark must have been placed in rodent-resistant vessels. Therefore, we should expect to find fragments of broken vessels.

Noah built an altar nearby. Earth and stone are the only known materials for an altar for animal sacrifice (Exodus 20:24–25). The altar should have survived in some form unless it was destroyed by religious vandalism.

Extrabiblical sources inform us that Noah was buried on top of the mountain near the Ark.⁷ St Ephraim lived in both Amida (Diyarbakir) and Edessa (Sanliurfa), adjacent to Karaca Dag. He said that Noah's tomb was near the Ark site.^{8,9} Hippolytus recorded the tradition that Noah brought the bones of the pre-Flood patriarchs in the Ark and reburied them after the Flood.¹⁰

Other probable criteria:

- Region of 'RRT' (Urartu, Ararat, Aratta)
- Mashu or Masis (names of Ararat in Sumer and Armenia)
- Villages on the mountain top¹¹
- East-west axis to the site of the Tower of Babel (Genesis 11)
- Nearby tombs of Noah and/or Pre-Flood Patriarchs

Finding the right mountain

We analyzed the traditions of the church fathers, Midrash, Book of Jubilees, and other historical sources for the Ark, with gratitude to Bill Crouse⁹ who did an excellent job

Table 1. Comparison of claimed facts to Ark sites

Claim	Source	Ararat	Durupinar	Cudi	Karaca Dag
On upper Euphrates	Philostorgius	no	no	no	yes
8 farsangs (48 km) from Tigris	Al Masudi	317 km	300 km	15 km	32 km
Quardu (Kurdish) Mountains	Targums	no	no	yes	yes
Vineyard on mountain top	Jubilees	no	no	alleged	North end
'Nachidshevan' at foot	Josephus	yes	no	no	yes
Dispersion near Ark site	Moses Chorenensis	800 km S	750 km S	160 km W	50 km E
Accessible to tourists	Berosus (Josephus)	no	no	yes	yes
Remains still visible	Theophilus of Antioch	no	yes	no	yes
Remains still shown	Epiphanius	no	no	Later structure	Later structure
A portion of the vessel still survives	Berosus & Nicholas Dams	?	yes	no	gravel today
Near area with excellent soil	Josephus (Ant. 20: 24, 25)	no	no	no	yes
District called Carron/ Cordon	Josephus (Ant. 20: 24, 25)	no	no	no	yes
Ark near summit of two peaks	Benjamin Tudela	yes	yes	no	yes
near island in Tigris	Benjamin Tudela	no		yes	yes
'Gordyaean Mts' Diyarbakır to Muş.	Strabo	no	no	no	yes
Gordean Mts & Urartu	Berosus (Josephus)	no	no	yes	yes
Boat grounded on inaccessible hill (nasirtu)	Epic of Gilgamesh	yes	no	yes	yes
In desert mountains near Syria	Theophilus of Antioch	no	no	yes	yes
In Parthia and near Phrygia	Julius Africanus	no	no	no	yes
Remains visible in Gordian Mountains	Eusebius	no	no	no	possible
Mountains of Quardu	Peshitta	no	no	yes	yes
Near Gordukh, Armenia	Faustus of Byzantium	no	no	yes	yes
Near Nisibis	Faustus of Byzantium	no	no	yes	yes
Mountain named Masis	Faustus of Byzantium	yes	no	no	yes
Noah's tomb on mountain top	Jubilees	no	no	Claimed, but not on top	yes
Noah's tomb near the Ark	St Ephraem of Nisibis	no	no	Claimed, but not on top	yes
Ararat Mtns, in Armenia, Gordyene, Lubar	Epiphanius	no	no	no	yes
Between Armenia and Gordyene	Epiphanius	no	no	no	yes
Remains still visible	Chrysostom	no	yes	Later structure	Later structure
Remains still seen	Isidore of Seville	no	yes	Later structure	Later structure
Mtns of Ararat, Mount Judi near Mosul	Eutychius	no	no	yes	no
Eastern Anatolia near Phrygia	Sybilis	no	no	no	yes
On route of Heraclius' return from defeat of Sassanids	Ibn al-Amid or al-Macin	no	no	yes	yes
Wood and nails	Philostorgius	claimed	no	Later structure	Later structure
Nails of a foot long still remaining	Hussein Aga	no	no	Later structure	Later structure
Total out of 35 points		4.5	5	16.5	30
Percentage		12%	14%	47%	86%

compiling those sources in order to justify Mt Judi as the Ark site. For this comparison we used the following pairings of Ark and Babel sites: Ararat-Babylon, Durupinar-Babylon, Judi-Tel Brak, Karacadag-Çınar. Table 1 compares proposed Ark sites using these criteria. For each of 35 claimed facts, one point was awarded for a strong positive, one half point for a weak positive, and zero points for a negative.

While patristic sources seem to converge on a mountain which lay in both the Tigris and Euphrates watersheds, we recognize that the early church fathers may have been mistaken.

Since we do not know if the church fathers had the correct site, let's consider some more objective criteria. As discussed in our Babel paper, the PPNA and the eight Neolithic founder crops have distributions roughly centred on the region around Diyarbakir, which includes Karaca Dag.²

While all nations scattered from Babel, the Bible informs us that 'Noah began to be a farmer' shortly after the Flood. Based on this evidence we would expect that farming began near the Ark site one to seven centuries before Babel was founded, depending on one's preferred chronology. For this reason, the maps of the current wild distributions of the Neolithic founder crops could be indicative of the Ark site. We recognize that changing patterns of rainfall could have altered the ranges of these plants in the time since the Flood.

Manfred Heun was the botanist who followed the DNA of domesticated wheat back to its source on Karaca Dag:

"We believe that the idea is so good—the idea of cultivating wild plants—that we think it might be one tribe of people, and that is fascinating," said Manfred Heun at the University of Norway's department of biotechnological sciences, who led the research team. "I cannot prove it, *but it is a possibility that one tribe or one family had the idea* [emphasis added]."³

The extrabiblical sources Josephus and the Book of Jubilees indicate that the 'Arkonauts' spent about a century on top of the mountains of Ararat before coming down to the plain to build Babel. This suggests that the mountain was low enough to allow agriculture and viticulture on its heights.

Josephus tells of one and Jubilees tells of three villages near the Ark site that preceded Babel. If these are accurate, then Babel is only the second or fourth oldest settlement in the world.

A 2004 DNA study of wild and cultivated grapevine genetics by McGovern and Vouillamoz found the region

where grapevines were first domesticated. Vouillamoz reports:

"Analysis of morphological similarities between the wild and cultivated grapes from all Eurasia generally support a geographical origin of grape domestication



Figure 1. Natufian civilization vector from Karaca Dag

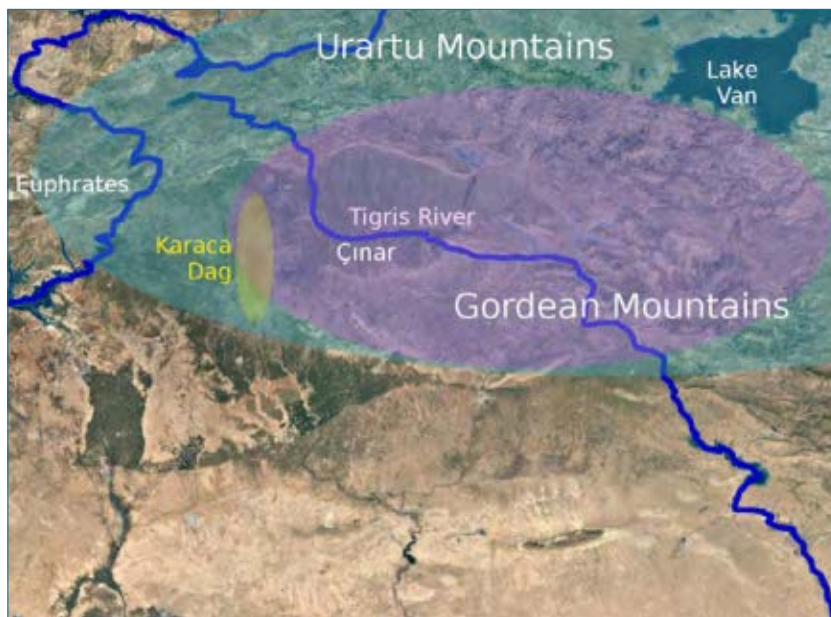


Figure 2. Estimated locations of Urartu and Gordian Mountains

in the Near East. In 2004, I collaborated with Patrick McGovern to focus on the ‘Grape’s Fertile Triangle’ and our results showed that the closest genetic relationship between local wild grapevines and traditional cultivated grape varieties from southern Anatolia, Armenia and Georgia was observed in southern Anatolia. This suggests that the headwaters of the Tigris and Euphrates rivers in the Taurus Mountains is the most likely place where the grapevine was first domesticated! ... This area also includes the Karacadağ region in the northern part of the Fertile Crescent.”¹²

Christian scholars, for nearly a millennium, have assumed Ararat was the Ark site and Babylon was the Babel site, despite these two sites being separated by 800 km of extremely rugged terrain.

Without delving into the chronology dispute between the LXX and MT camps, we ask a simple question. If you came from an advanced society and landed in a barren new world in a massive ship containing food, tools, containers, furniture, thousands of storage vessels, and a library, and you did not have any roads, exactly how far would you travel on foot to found your new capital city?

Given that the time for the multiple round trips required to carry the cargo to the new site increases at double the increase in distance, would not the answer be “the shortest distance possible”? The Ark was a container ship full of valuable equipment for a nascent civilization with no immediate means to obtain more metals or high-quality tools.

Karaca Dag lies very near the centre of the PPNA sites and the wild ranges of the eight Neolithic founder crops. To this we can add the first viticulture, and the first domestication of dogs and pigs. The evidence that virtually every aspect of farming began on or near Karaca Dag strongly suggests this is the most likely Ark landing site. The fact that the PPNA nations spread out from Karaca Dag also suggests it is near ground zero for Babel.

Figure 1 shows a map of the Natufian Culture, which is the oldest known civilization in Canaan. It matches the Canaanite horn of the PPNA, as shown in our Babel paper. The Natufian distribution looks like a vector directly from the mountain Karaca Dag to the Land of Canaan, suggesting that Karaca Dag was the point of origin.

Figure 2 shows estimated locations of the ‘Mountains of Urtu’ and the ‘Gordean Mountains’ using the data in table 1.

Geology

Karaca Dag is a shield volcano located on the Arabian Plate, believed to have erupted in the Pliocene.¹³ The lava flows have been dated to 2.7–1.5 Ma by argon dating alone.¹⁴ Both Karaca Dag and Mt Judi are shown as being Pliocene deposits, one volcanic and the other sedimentary.¹⁵

This Ark site falls into the middle of the creationist debate over the post-Flood Boundary. Using the criteria of Snelting,¹⁶ the lead promoter of the K-T boundary, a Pliocene site is post-Flood. If the post-Flood boundary is below the Pliocene, then both Karaca Dag and Mt Judi would be ruled out.

The new ICR Flood Model of Clarey¹⁷ defines the post-Flood boundary at the Neogene-Quaternary boundary (N-Q) just above the Pliocene, by which both sites would pass.

Unlike Mt Ararat and Mt Judi, Karaca Dag is surrounded and covered with confirmed remains of the very oldest human civilization on Earth, the PPNA. Those who claim the mountain was formed by post-Flood eruptions have the burden of explaining how the Neolithic farming revolution could have occurred atop an actively erupting volcano, the sheer scale of which would have wiped out any humans living near it.

Farming is normally done in valleys, because deep soil accumulates there. The only instances where farming was found on mountains have been where the bottom lands are already maximized and population requires it. The origin of grain farming on top of a single mountain goes against everything we know about agriculture. Yet the evidence is established. Farming began on the slopes of the mountain known as Karaca Dag. Having seen those rock-covered slopes in person, we can attest that it is the last place anyone should ever try to farm.

If we put off the problem by positing that Babel occurred five to seven centuries after the Flood, we now must explain why paleolithic man, whose remains have been found from Europe to Japan, suddenly converged on Karaca Dag to begin farming, viticulture, and domesticating animals only in one place. Even the Levantine Neanderthal sites are congregated around Karaca Dag.

We see three possible explanations for the data:

1. The mountain may be older than the Pliocene.
2. Logic requires that one or both of the Flood-boundary positions must be wrong.
3. This site may be something much later than the Flood or Babel, and isn’t what we think it to be.

We will simply share what we’ve found and leave the boundary debate to the geologists.

Mount Mashu

The old name of Karaca Dag is ‘Masia’¹⁸ which is based on the older words ‘Masis’ or ‘Mashu’, which means ‘high hill’ in Semitic. The Armenian name for Mount Ararat today is also ‘Masis’, indicating that Karaca Dag may be the original Armenian Masis, prior to their expulsion from their southern homeland.⁹ The Armenian ‘Masis’ means a double peak. The seventh summit of Karaca Dag also appears to be a twin peak.

The Altai flood legend states that the Ark landed on a mountain with eight peaks.¹⁹ Both the Epic of Gilgamesh and “Enmerkar and the Lord of Aratta” require the hero to cross seven mountain ranges or peaks to arrive at the site.

Livingston argued that Gilgamesh claimed to have taken revenge on the God ‘Huwawa’, who sent the Flood, and that Huwawa is a corruption of Jehovah.²⁰ This suggests that Gilgamesh went to the ‘Cedar Mountain’ to kill Jehovah, or symbolically, His priesthood. If a man of the era before Abraham wished to take revenge upon Jehovah, one might expect to find Him at the altar where He was worshipped. The only altar to Jehovah prior to Abraham that we know of was the one built by Noah near the Ark.

Following Dr Livingston,²⁰ we presume the Ark and altar were the destination of the first journey of Gilgamesh. Thus the ‘Cedar Mountain’ may have been the same general location as the city of Aratta, and the Bible’s ‘mountains of Ararat’. While often assumed to be a reference to the Libanus mountains of Lebanon, the Epic of Gilgamesh places the Cedar Mountain in the Euphrates watershed.

“They uncovered the sacred dwellings of the Anunnaki and while Gilgamesh felled the first of the trees of the forest Enkidu cleared their roots as far as the banks of Euphrates.”²¹

They then floated the logs down the Euphrates to Uruk. Therefore, it must have been located near the Taurus Mountains.

Using the information found in the Epic of Gilgamesh, we would expect to find a mountain in the Euphrates watershed with eight peaks or ranges, and the sacred site near the seventh. Upon this mountain would be found the ‘sacred dwellings of the Anunnaki’ and the ‘throne of Ishtar’.

Karaca Dag fits the description of Mount Mashu and has borne that name in some form from earliest antiquity until the 20th century. It is also situated on the headwaters of both the Tigris and Euphrates Rivers, as claimed for the Ark site by extrabiblical witnesses Gilgamesh, Philostorgius, Benjamin Tudela, and Hussein Aga. The question is whether we

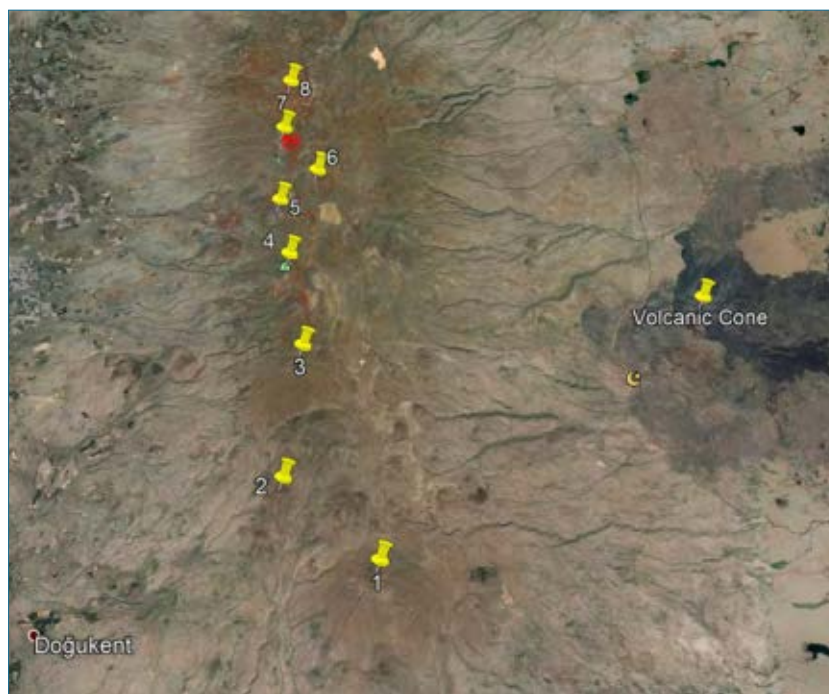


Image: Google Earth (modified by author)

Figure 3. Karaca Dag with its eight peaks numbered

Table 2. Geoglyphs

Number-Name	Coordinates	Comment
Pointer	37°45'42.89"N 39°48'12.29"E	154.5° azimuth
Window	37°42'50.87"N 39°46'13.16"E	90.05° azimuth to centre of tomb
Man	37°42'25.04"N 39°46'51.52"E	Appears to be a letter or two
Three letters	37°43'18.60"N 39°46'11.51"E	Three letters
Tav	37°43'33.35"N 39°46'3.87"E	Surveying artifact
Ark	37°40'45.79"N 39°46'49.64"E	Centre line points to hill nearest Ark site
Four quarters	37°40'46.05"N 39°48'10.47"E	Circle divided into four quarters
Uncertain glyph	37°40'48.78"N 39°47'21.52"E	Need better resolution

can find the correct site on the mountain, the site where the Ark landed.

Sites on the mountain

Karaca Dag has eight peaks that stand about 100 m higher than a plateau of 1,800 m, which is 11 km wide and 22 km long from north to south. We number the peaks 1 to 8 from south to north (figure 3).

We will review the sites on the mountain from the outside in, leaving the tomb and Ark site for last.

Geoglyphs

The geoglyphs on the northwest side of the mountain range in size from 100 to 400 m. We have not been able to find any mention of these geoglyphs in previous literature, scholarly or otherwise. We seem to be the first to write about them, and possibly the first to even notice them. Table 2 lists the geoglyphs with coordinates. Figure 4 shows the six most legible geoglyphs. After obtaining access to higher resolution satellite photos, we have located eleven more circles with symbols, clustered near the window and ark geoglyphs.

The geoglyphs drew our attention to the site that we now suspect to be the Ark and tomb of Noah.

The flanks of the mountain are completely covered in loose stones. The geoglyphs were created by either removing or piling up stones. They are clearly visible from the air, but nearly impossible to see from the ground.

Geoglyph 1 points directly at the tomb and ‘Ark site’ from 5.6 km away on the north side. Geoglyph 2 is perfectly due west of the centre of the tomb, within 5 hundredths of a degree of accuracy.

The centreline of the Ark geoglyph 6 points to the nearest hilltop to the ‘Ark site’ with the TV station. Thus, three of the geoglyphs point or have directional relationships to the site.

Geoglyph 3 appears to be both a letter and perhaps an image of a man. The letter vaguely resembles a Latin N or an hourglass.

Geoglyph 4 merely looked like a circle within a circle from satellite photos. But our drone was able to get a closeup and we can clearly see three letters (figure 5).

We have been unable to find an expert who can read the letters or tell us what script it is.

Figure 6 shows how the six geoglyphs are located about 5.6 km from the tomb.

We can draw several conclusions from the geoglyphs:

- One of them (no. 6) could be a representation of the Ark.
- They are roughly equidistant from the tomb and Ark site described below.
- Being invisible from the ground, whoever made them went to a great deal of effort to bring attention to this site using a method that shows a very long time horizon.

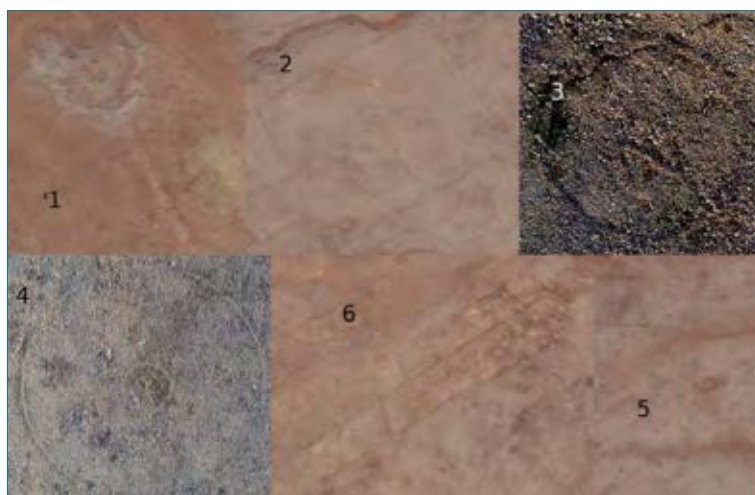


Figure 4. Composite image of six of the geoglyphs



Figure 5. Geoglyph 4 with letters highlighted

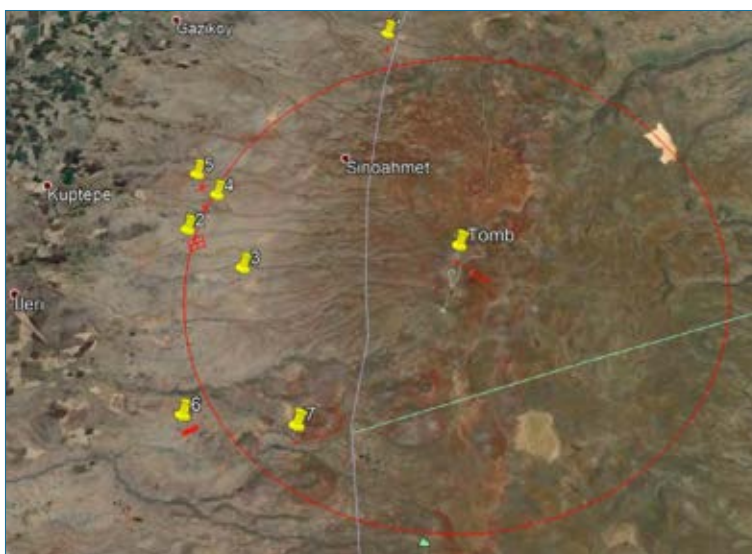


Figure 6. Geoglyphs relative to each other and to the tomb and Ark site. Circle is 10,000 royal cubits radius from the tomb centre.

- Unless they were made for the ‘gods’, the authors anticipated mankind would learn how to fly.
- Whoever made them had writing, geometry, and surveying.
- They are a message from the ancient past to people of the future.

The road grid

10 km north of the site there is a remarkable road grid running north–south and east–west that covers an area 100 km long by 40 km wide. The intersections are aligned to true north with less than half a degree of error. The way these roads were made, and the degree of knowledge of surveying apparent by their accuracy, suggest they are related to the tomb, geoglyphs, and Ark site on the mountain top (figure 7).

The roads were made by simply removing the loose stones and setting them to the sides. In the areas where the grid crosses fertile soil, the lines have been erased by farming. Where there are outcrops of barren lava flows within the fertile soil, the grid lines are still found. Thus, we conclude these grid lines were made in the far ancient past, though we cannot pinpoint when.

The terraced hills on the south end of Karaca Dag

Jubilees and Josephus both record the tradition that the survivors of the Flood lived atop the mountain for a century before they came down to build Babel. According to Jubilees, Cham went with his family to live separately after the nakedness incident and built a village on the south side of the mountain.²² We found ancient villages at the south and north ends of the mountain.

We found on the south end of Karaca Dag at peak no. 1 an ancient village with stone buildings, surrounding an acropolis topped with the remains of a domed room with a window facing southeast (figure 8). It lies within a 10 x 9 km terraced region with roads of similar construction to the grid at the north end of the mountain (figure 9).

The village on peak no. 1 may be the legendary city of Aratta, the ‘Throne of Ishtar’ (table 4). In the Sumerian Epic, Enmerkar and



Image: Google Earth

Figure 7. Grid lines viewed



Image: Google Earth

Figure 8. Stone village located on peak no. 1; perhaps Aratta?



Image: Google Earth

Figure 9. Terraces and roads around peak no. 2 of Karaca Dag

Table 4. First Neolithic villages

Villages	Coordinates	Comment
Aratta?	37°33'29.39"N 39°52'19.33"E	Cham
Nachivan?	37°48'3.62"N 39°48'22.08"E	Noah + Shem



Figure 10. Tomb and Ark site overview with objects numbered



Figure 11. The three-part tomb

the Lord of Aratta, Enmerkar vies with the Lord of Aratta for the love of Ishtar, whom Johnson²³ and Gill identify as Naamah, the daughter of Lamech in Genesis 5, and the first wife of Cham. As per John Gill's commentary on Genesis 4:22:

“... our Bishop Cumberland conjectures, that she was the wife of Ham, was with him in the Ark, and after the flood was the means of leading him into idolatry:

Table 3. Objects on site

No.	Name	Comment
1	School building	Ark Section 1
2	School building	Ark Section 2
3	School building	Ark Section 3
4	Small school building	Altar
5	Four small cairns	Solstice mound
6	Circle of stones with rectangular pit	Gnomon pit
7	Rectangular mastaba tomb	Noah's tomb
8	Tomb extension	
9	Tomb extension	
10	Three recent tombs	River gravel here
11	Circle of stones with small pit	Survey point
12	Pile of basalt chips	
13	Power transformers	
14	Elongated pit	Borrow pit?

what led him to this conjecture was, that he observed in Plutarch, that the wife of Cronus, the same with Ham, is by some called Nemaus, which brought Naamah to his mind.”²⁴

En-mer-kar, whom Rohl identifies as Nimrod,²⁵ tries to lure her down from Aratta on the mountain to his beautiful brick built ‘Kulaba’, which is a city and temple.

This epic is probably a memory of Nimrod attempting to persuade his grandmother Naamah that it was safe for her to come down from the mountains of Ararat and live in the city of Erech, which he built for her along the Tigris River in the land of Shinar. The sites we propose as Babel and Erech are 52 to 66 km northeast of this site.

The terraced area is too cold and stony for farming. From satellite it appears to be currently cultivated land, but it is not. Only shepherds walk here today. The mountain of ‘Hiriki’ was occupied as late as the time of Tiglath Pileser I, who claimed to have stained it red with the blood of its inhabitants.²⁶

The tomb and possible Ark site

Centred between the grid of the north end of the mountain and the terraces of the south end we find the complex of buildings that we believe to be the landing site. Coordinates: 37°42'44.58"N 39°49'56.80"E (figure 10 and table 3).

The site is near the centre of the widest part of the plateau, adjacent to peak 7 when counting from south to north. Peak 7 is a double or triple peak, depending on how you count it, with saddles between the hilltops. These peaks are now occupied by a television station, military radar base, and a weather radar station. The tomb is located on the saddle between the northern two hilltops.

The Tomb

The tomb has a central stone mastaba, 60 m², facing the winter solstice at 113.5°. On the north and south sides are trapezoidal additions that make the entire structure resemble a gigantic stone canoe, about 160 m in length (figure 11).

The school buildings

East of the tomb lie the collapsed remains of the school presumed to have been built during Attaturk's literacy drive around 1928.²⁷ The US Air Force used the abandoned school as a temporary barracks in 1967 while they built the radar station on the nearby hilltop. They later demolished it with explosives. What remains is a rubble field of bricks and shattered concrete with protruding rebar. The school was composed of four buildings, which we have numbered 1–4.

Other features

The smallest building on the school site is a square concrete slab, no. 4. Approximately 300 m due east of the slab is a circular pit with a rectangular shape dug out of it. We call this the gnomon pit, no. 6, because it appears to have been used to measure the direction of the sunrise.

Due north of the square slab is a small mound, no. 5, of different coloured earth with four small stone cairns. The azimuth from the cairns to the gnomon pit is 113.5°, which is the azimuth of winter solstice sunrise. The slab, gnomon pit, and cairns form a right triangle (figure 12).

340 m north–north-west of the gnomon pit is a circular depression fenced with stones that we called the 'survey point', no. 11. This point is aligned to the cairns and the gap between the two large school buildings at a 45° azimuth, to the corner of the square slab at 30°, to the north edge of the tomb at 270°,

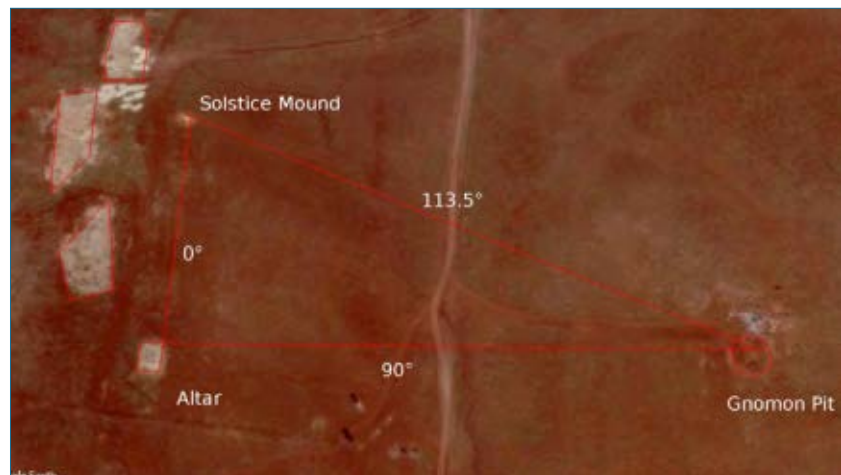


Figure 12. Solstice mound



Figure 13. Solstice alignment of tomb to gnomon pit

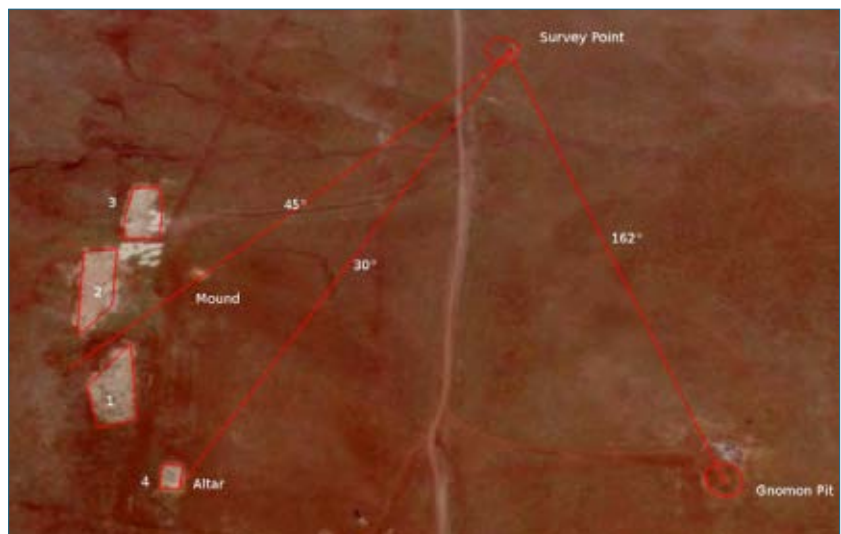


Figure 14. Relationship of survey point to other objects

Image: Google Earth (modified by author)

Image: Google Earth (modified by author)

Image: Google Earth (modified by author)



Figure 15. Tomb, survey point, and gnomon pit equidistant from the centre of 1–2 gap

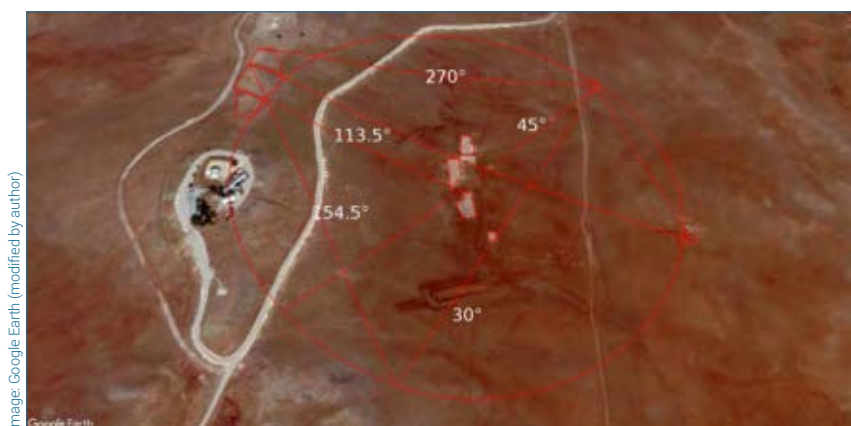


Figure 16. Winter solstice site plan



Figure 17. 113.5° alignment of north and south edges of tomb with buildings 1 and 3

and the long axis of the rectangular gnomon pit. These azimuths cannot be random.

125 m south of object no. 1 there is a long trench, no. 14, dug into the hill. We think this is a recent ‘borrow pit’ used to get fill for the construction projects, because it cuts one of the ancient roadbeds.

There are about 20 bright white piles of rubble around object no. 3. Examination revealed them to be dump truck loads of broken concrete from a renovation project on the radar base above.

Interpreting the site

At first glance the tomb is interesting. The remains of the school are a mess. There is no obvious relationship between the two. However, careful study reveals the site to be laid out according to a geometric plan.

The solstice sight line from the gnomon pit to the cairns extends through the joint between buildings no. 2 and no. 3 up to the tomb, and along the northern edge of the square mastaba (figure 13).

The survey point seems to have a special relationship to the gap between buildings no. 1 and no. 2, as well as the altar, solstice mound, and gnomon pit (figure 14).

The gnomon pit, survey point, and the close edge of the tomb are equidistant from the centre of the gap between buildings no. 1 and no. 2 (figure 15).

Combining these observations together we found a geometric design that it appears was used to position the tomb in relation to the footprints of buildings 1–3 so that the winter solstice sunrise shines over whatever was previously there onto the tomb (figure 16). This strongly suggests that the 1928 school was built on top of something of the same age as the tomb, which appears to be thousands of years old.

The two extensions to the tomb are also aligned to the northern and southernmost edges of buildings 3 and 1, as

well as the corner of 4, as shown in figure 17.

We recommend that readers make their own measurements using Google Earth Pro to test our findings, rather than attempting to use ratios directly from our illustrations, which are distorted by the 3D perspective algorithm in Google Earth.

Hypothesis—they cut the Ark in three pieces

Judging from the positioning of the tomb relative to buildings 1–3, we suspect the school buildings were built atop the gravel ballast of the Ark, long after all the wood had rotted away. Combining the three buildings gives a length of about 157 m, or 300 Egyptian cubits; and the width of the buildings is about 50 cubits. Grant us, for a moment, a speculation.

We have reason to believe that the draft of the Ark was 15 cubits, based on the report that the water covered the mountains to 15 cubits, and the height of the Ark was 30 cubits. Thus, the waterline was halfway up. The door in the side would have to have been above the waterline on the top deck.

When loading the Ark, the heaviest objects would be placed in the bottom deck for stability. Some particularly large or heavy objects might have been laid in the bottom deck while the vessel was still under construction. What objects might these have been? Perhaps there were one or more stone sarcophagi of the patriarchs, machines, stone jars, water tanks, vehicles, metal ingots, etc.

After the Ark landed, this arrangement would create a particular problem. The bulkiest and heaviest items on the bottom deck may have been difficult or impossible to get out of the door on the top deck.

From the layout of the buildings that we hypothesize were built upon the Ark remains, it appears that the ‘arkonauts’ severed the northernmost quarter of the Ark, and rolled it downhill just far enough to allow access to the interior. A poorly executed unjacking might have tipped the floor hard enough for the ballast gravel to slide to one side, making the gravel footprint that later became building 3 narrower than the others.

Since the second cut at 45° through the remaining long section of the Ark divides it into two roughly equal pieces, we surmise this cut was made later, perhaps at the time of the

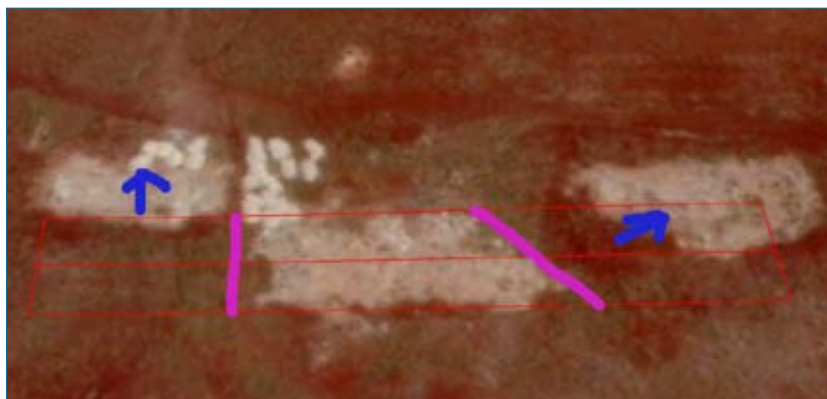


Figure 18. Hypothesized landing position of Ark, cuts, and sections moved. 52.36 cm cubit.

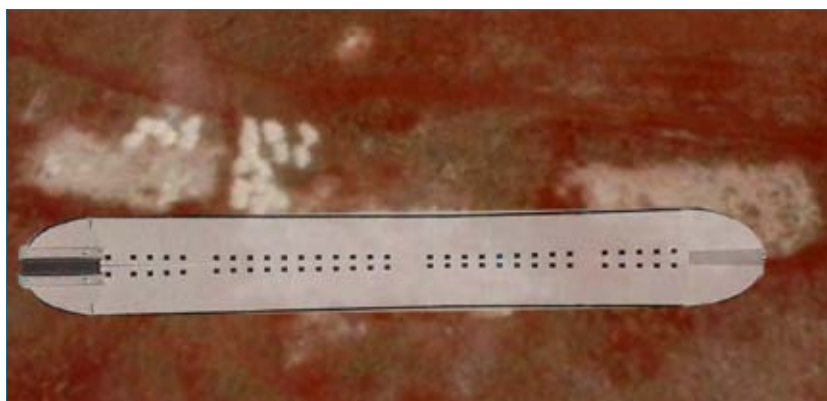


Figure 19. Ark Encounter top photo overlay to scale. (Distorted perspective caused by Google Earth)

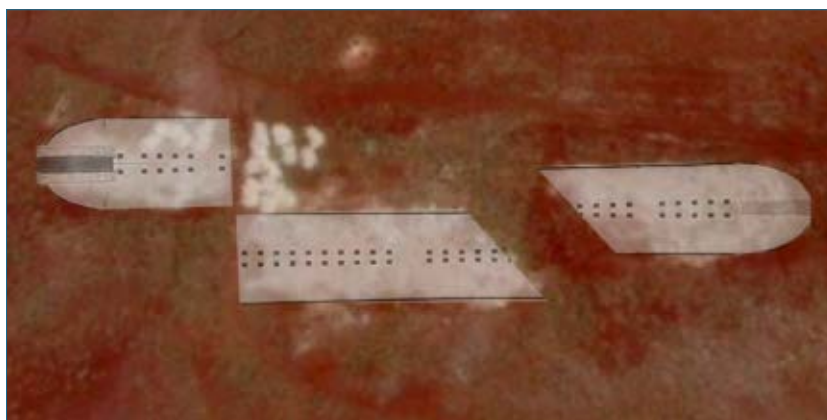


Figure 20. Ark encounter pieces overlaid to scale

tomb construction. Section 1 was moved about 8 m downhill to the southeast, and may have been deliberately positioned.

We estimate the Ark would have required 1–2 m of gravel in the bottom as ballast. A gravel patch of such size and depth would allow a modern building to be built on top with minimal excavation. The foundation is typically one third of the cost of a building.

Buildings 1–3 are certainly not a typical design, and do not have 90° corners. Unless the architect was insane the shape of the school buildings appears to have been dictated by something that was already there.

The brick and concrete remains of the school would then approximate for us the previous location of the Ark sections. Soil cores will be required to prove that. We expect soil cores to reveal gravel down to a depth of about 2 m, with remains of the bottom deck below that. The wood would probably be gone. However, at minimum there would be a soil horizon stained with tannins, and possible remains of bitumen flakes.

If our speculation is correct, then there are two reasons to suppose that building 4 was built on top of Noah's altar. First, the altar had to be near the Ark. Building 4 is the smallest, closest to the other three, and is square. Second, it was universal ancient practice to position altars so that the first rays of dawn shone on them at the equinox or solstice. The placement of the gnomon pit due east of building 4 suggests this kind of relationship.

Figures 18–20 show our hypothesis of how the Ark was cut into sections.

A method to the madness

We offer this simple hypothesis to explain the strange relationship of the tomb to the remains of the school.

God's 'rainbow covenant' at the altar promised not to destroy the world again with water and that summer, winter, seedtime, and harvest would perpetually continue (Genesis 9).

By building the tomb so that the winter solstice sunrise shines over the altar and the Ark onto it, the tomb and the Ark were joined together into a clock made of stone. Every winter solstice sunrise, when the first ray of dawn shines over the altar and touches the tomb, it shows that God's promise held true for another year (figure 21).

Winter solstice alignments are common in ancient temples, so the solstice alignment does not prove this is the Ark and tomb. But we can see why this alignment might have made sense to someone who wished to create a monument to commemorate Jehovah's deliverance of mankind from the Flood and His new covenant with them.

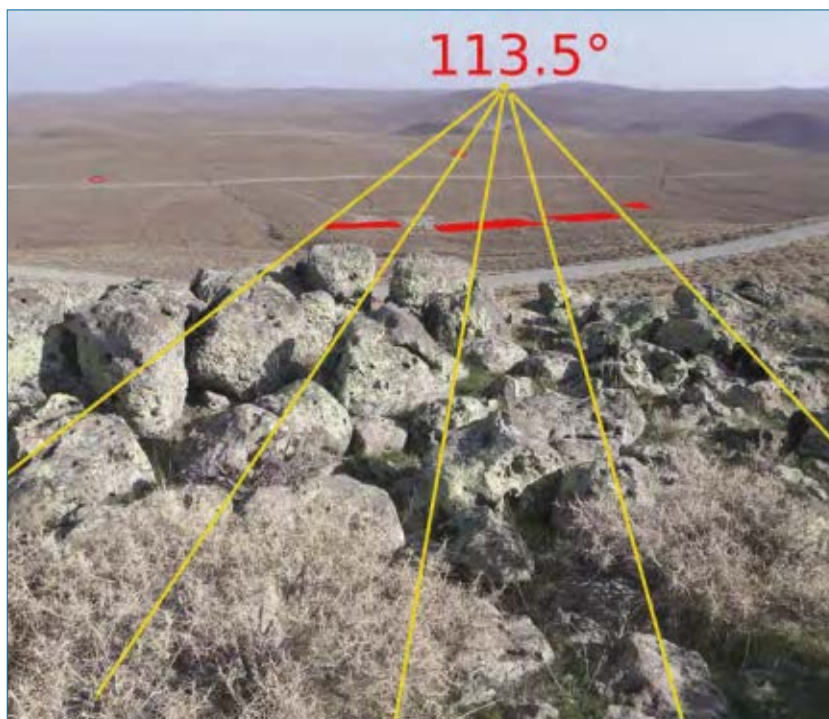


Figure 21. Simulated view of winter solstice sunrise from centre of tomb

Objections

1. Humphreys argued that since the Ark settlers came from the east, and since Sumeria was Shinar; therefore, the Ark must lie in the Zagros Mountains east of Iraq.²⁸ Given the diversity of translations for Genesis 11:2, it might be safer to say Babel was on an east–west axis to the Ark site. Humphreys assumed that Shinar was Sumeria. As shown in part I of this paper, there were several locations between the Tigris and Euphrates known by the name Shinar. One of them, Çınar, is east of this site.

Crouse⁹ and Habermehl²⁹ maintain that Mt Judi was the Ark site. However, the majority of their arguments could just as easily apply to Karaca Dag.

The church fathers may have indeed known the location of the Ark up until the Muslim invasion. Whether the legends referred to Judi Dagh or Karaca Dagh is an open question. Alternatively, the legends about Judi Dagh may have been a case of mistaken identity even back then.

2. "The tops of the mountains were seen" six weeks after the Ark landed (Genesis 8:4–5).²⁸ Karaca Dag is shaped like a large table. Though it is the highest mountain in 100 km, from the Ark site the surrounding mountains are not visible because they are below the rim of the plateau.

Assuming prevailing winds from the northwest at this latitude, the humid air blowing up the west side of Karaca Dag would be expected to condense, shrouding the mountain top in clouds. As the water receded out of the region,



Image: Google Earth (modified by author)

Figure 22. Karaca Dag overview of all sites. North points left.

the humidity in the winds fell, and the mountain top was no longer shrouded in constant clouds.

The tops of the mountains they would have seen were Karaca Dag's peaks 5, 6, 7, and 8 nearest to the Ark.

3. The river gravel could have been brought up from the Tigris Valley in trucks along with the bricks. We examined the aggregate in the concrete of the school and found a mixture of crushed white stone with jagged edges and small rounded river stones, many of which were black.

An architect would have prescribed the crushed stone for aggregate because it grips the cement better than smooth rounded river gravel. The question is where the builder obtained the river gravel. Was it from the site or from a river quarry in the valley below?

A study of nearby quarries will be necessary to rule out a local source of the river gravel.

Conclusions

The Epic of Gilgamesh says Enlil had designated the Cedar Forest on the mountain as a forest sanctuary called 'The Land of the Living'. Gilgamesh went there to kill the guardian, Huwawa, and desecrate the place.²⁰

We observed no evidence of farming or habitation around the tomb and Ark site. But the mountain is covered with such evidence 10 km north and south. It seems reasonable that Noah may have designated the site as a sacred precinct, the

world's first national park, a refuge around the Ark where no hunting was allowed. This would have allowed the animals to repopulate the earth, while allowing humans to hunt them outside the park.

Excavation will be required to confirm our identification of these sites. Here is a summary of the evidence:

1. Anthropology—it is the mountain closest to the centre of the PPNA, and the Levantine Neanderthal distribution.
2. Biology—the genetic ancestor of all strains of domesticated einkorn wheat is found on this mountain, along with seven other founder crops of the Neolithic revolution.
3. Viticulture—the domestication of grapevines occurred on the North side of Karaca Dag.
4. Etymology—the old name of the mountain is Masia, Masis, Mashu.
5. Linguistics—geoglyphs with writing in an unknown script.
6. Geography—the mountain is within the territory of the Kingdom of Urartu from 700 BC.
7. Surveying—large geoglyphs, three of which point to the site, one looks like an Ark.
8. Archaeology—evidence of human habitation and farming near the site at an elevation currently inhospitable to agriculture.
9. Architecture—large stone tomb, roughly shaped like a boat, 160 m long.

10. Archaeoastronomy—the tomb is oriented to the winter solstice sunrise.
11. Geometry—the tomb, geoglyphs, and grid show knowledge of geometry and 30° angles.
12. Geology—river gravel found on site, alien to the mountain.

Interpreting the Sumerian ‘Anunnaki’ as a case of ancestor worship, ‘Anu’ would appear to be a corrupted memory of Noah, whose name in Hebrew was NU. We conclude that Karaca Dag is probably the ‘sacred mountain of the Anunnaki’ where Gilgamesh went, and the sacred precinct was called ‘the land of the living’ because when they asked themselves what land they had come to, the only reasonable answer was ‘the land of the living’, because everyone else was dead.

Figure 22 shows an overview of the mountain with some of the grid lines, estimated sacred precinct, and the speculated ‘Aratta’ with its terraced region.

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Horus—the deified Ham: part 2

Gavin Cox

One of the most famous and ancient of Egypt's many deities was Horus, the falcon sun-god. This article explores connections between this deity and Noah's third son Ham. In part two, I concentrate on motifs 5–12 drawn from Genesis 5–11. Specifically, comparisons between motifs: 5) Ham's father vs Horus's father; 6) Ham vs Horus and global Flood judgment; 7) Journey in the biblical ark vs Egyptian bark; 8) Ham vs Horus and sexualized, political, brotherly enmity; 9) Ham vs Horus and their four sons; 10) Ham vs Horus and their journey from the East; 11) Ham vs Horus eponymously naming Egypt; and 12) Ham vs Horus living to great ages. I conclude, through comparisons of Egyptian evidence with these seven biblical motifs, that the pagan Egyptians likely deified Ham as Horus.

In part 1, I began to build a positive case that there are intriguing parallels between Noah's third son, Ham, and Horus, one of Egypt's most famous and ancient of deities—represented typically as a solar-falcon, or falcon-headed man. Part 2 compares Horus with the next eight motifs (derived from Genesis) drawn from Ham's life. Specifically, motifs: 5, comparisons between Ham's father and Horus's; 6, Ham's vs Horus's journey through the Flood; 7, Noah's Ark vs the Egyptian bark; 8, Ham vs Horus and sexualized, political, brotherly enmity; 9, Ham vs Horus and their four sons; 10, Ham vs Horus and their journey from the East; 11, Ham vs Horus eponymously naming Egypt; and 12, Ham vs Horus living to great ages. The combined evidence discussed here builds the case that the pagan Egyptians deified Ham as Horus.

Motif 5 (a–d). Ham vs Horus—fathers

Motif 5a. Fathers: Geb and Osiris vs Noah

Ham's father was Noah, the Flood patriarch (Genesis 5:32ff). Evidence from Old Kingdom Pyramid Texts (OK PTs) demonstrate the father of Horus is predominantly Osiris but, in several cases, Geb, the earth-god (of the Ennead), who is simultaneously father of Osiris (Pepis I PT-518§1195a–b). For example:

Pepis II PT-478§973a

jt r=f hr.w 3(.t)=f tp=f hsf hr=f m jt(j)=f gbb.

“So **Horus** comes, with his power on him and as his face approaches his father **Geb**.”

Unas PT-219§176a

hr(.w) jt(j)=k pw p(w)-nn (w)sjr di.n=k sdb=f anhf=f.

“**Horus**, this one is your father, **Osiris**, whom you revived and let live.”

If Horus is the deified Ham, in what way are Geb and Osiris like Noah? Regarding Geb's function, Egyptologist H. te Velde states:


“Innumerable texts and expressions dating from all periods of Egyptian history testify to the connection between Geb and the earth The word *gbb* ‘earth’, [Wb 5, 164.7–8] too, is derived from the name of the god”¹

For instance, Coffin Text (CT)-78 describes how Shu separated his children Geb (the earth), from Nut (the sky) during creation.² At Genesis 5:29, Noah is associated with the earth by Lamech, who prophetically:

“... called his name Noah, saying, ‘Out of the ground [*āḏāmāḥ*] that the LORD has cursed, this one shall bring us relief from our work and from the painful toil of our hands.’”

This verse connects to Genesis 8:20–21 where Noah's soothing (*nīḥōḥ*) sacrifice brought relief from YHWH's curse to the ground/soil (*āḏāmāḥ*). Later, Genesis 9:20 states: “Noah began to be a man of the soil [*ʾiṣ ḥāʾāḏāmāḥ*], and he planted a vineyard” (ESV). Here, Noah became the Second Adam, a “man of the soil”, to restart the new post-Flood world. Noah's produce of the ground (wine) brought a soothing/(*nīḥōḥ*) rest from Noah's labours (Genesis 9:21) and with it, a fresh curse (see motif 8).

Motif 5b. Noah: ‘rest’ vs Osiris ‘tired’

Divine epithets of Osiris (phonetically reminiscent of ‘Noah’) include *Nny*, which means ‘The Tired One’ (LGG IV, 248–249), known from the Middle Kingdom, whose hieroglyph shows a ‘resting figure’, ‘*nu* pot’ and ‘seated god’ . For example CT-431 states: “the Inert One (*nny*) who ascends from the watery-abyss (*nn*).”³ Significantly, *nny* is also an OK epithet meaning ‘tired’ e.g. PT-578§1534a. The divine name *Nw.w* ‘Nun’ (Wb 2, 215.5–6) is found commonly in PTs, e.g. PT-233§237a. Text from the 26th Dynasty texts (664–610 BC) also place Osiris directly in the Abyss:

pBrooklyn 47.218.84

wnn wsjr m n.t nw.w

“**Osiris** exists in the **Nun**.”

Noah means ‘rest/comfort’ (cf. Genesis 5:29) and is conceptually equivalent to Osiris (*Nw/nny*) (‘tired/inert’)—offering a striking semantic and phonetic connection with Noah.

Motif 5c. Osiris and Ogdoad Nu

My previous article⁴ identified Ogdoad Nu as the paganized memory of Noah. Is Horus’s father Osiris connected to Nu? Egyptologist H.M. Tirard recognized that Osiris and Nu (of the Ogdoad) were interchangeable, stating:

“In one of the lists of the Ennead the name of Osiris is replaced by that of Nu, the primaeval water ...”⁵

Tirard was possibly referring to the 30th Dynasty “Great Litany”. Here, Nun (Nu) replaces Osiris within “Address 11–20”, which identifies the “Great Ennead” of Heliopolis as “Atum, Khepri, Shu, Tefnut, Geb, Nut, Isis, Nephthys, Horus, and Nun.”⁶

Motif 5d. The festival of Khoiak—reflections of Noah? (Including motifs 7 and 8)

A festival of Osiris called Khoiak⁷ dramatized the struggle between Osiris and Seth, resulting in Osiris’s death and resurrection. The festival started on the 12th day of Hathor (Greek *Athyr*)—third month of the year, and season of Akhet (Inundation). Khoiak lasted until the end of the month, commemorated by Osiris’s revivification—marked by planting crops at the start of the new agricultural year. Scholars, utilizing multiple sources, have reconstructed the festival program. Sources include a 12th Dynasty (c. 1870–1831 BC) stela from Abydos, (belonging to Ikhnofret) and a royal stela of Neferhotep I of the 13th Dynasty (c. 1741–1730 BC).⁸ Importantly, many aspects of Khoiak find echoes in the OK PTs.

The festival commemorated the drowning of King Osiris by Seth, who then dismembered his body. These parts were delivered throughout Osiris’s kingdom. Osiris’s wife, Isis, relentlessly searched for the pieces, finding all but his

phallus—so Isis modelled a new one. She mummified the pieces, which revived Osiris, who fathered Horus by her. Osiris then descended to the underworld as Lord of the dead. After this, Horus, Osiris’s son and heir, violently and incestuously struggled against Seth—until Horus’s final victory (see motif 8). However, in the festival, Seth is no longer Osiris’s son (as per some PTs), rather his evil brother.

Greco-Roman temple texts at Dendera relate Khoiak’s dramatization. Priests commemorated Horus lifting Osiris’s body from the water of the sacred lake and carrying it to the temple. Osiris was represented by a model mummy made of bitumen—placed in a small wooden boat, ritually floated across the ceremonial lake (representing Nu/Primeval Ocean)—and buried by Horus priests in the temple. The priests processed with other gods past Dendera’s obelisks (representing the Benben, or primeval mound), erected to represent Osiris’s resurrection.⁹

Plutarch, the Greek philosopher (c. AD 46–119), ascribed to Egyptian priests¹⁰ the belief that Osiris died on the 17th of Athyr, when Seth (Typhon), by trickery, trapped Osiris in a wooden box, which was cast into the Nile, and floated out to sea (13, 356C–D; 69, 378E).¹¹ In confirmation to Plutarch’s testimony, an epithet of Osiris describes him as *dbn.j* “He-who-is-in-the-box (Osiris)” (Wb 5, 437.17), occurring in Unas, PT-219§179–184, along with allusions to Osiris’s dismembered limbs:

§179. “Nut, this is your son, Osiris, of whom you said, ‘Was born to me’, you said ... after his beloved son Horus opened his mouth and the gods counted his limbs.”

§184a. “In your name “... the one in the box [*dbn.j*]...”

Osiris’s ‘ordeal by water’ within his *dbn* ‘round-topped wooden box’ (Wb 5, 437.16) has some fascinating parallels with Noah and Moses. Of the latter two biblical figures Old Testament scholar John Currid states:

“... the water ordeal Moses underwent is reminiscent of the redemption of Noah in Genesis 6–8. After the birth of Moses, his mother Jochebed could not hide him for more than three months, so she placed him in a [*tēḥaṭ gōme*] (‘wicker basket’; Exod. 2:3). ... *Tēḥaṭ*, an Egyptian word which means ‘chest, coffin’, is also used in reference to Noah’s ark [*tēḥaṭ ʿāṣē-gōper* ‘ark of gopher wood’ Genesis 6:14]. One should observe as well that in Exodus 2:3 Jochebed covers the wicker basket with ‘tar and pitch’ as Noah did the ark (Genesis 6:14). The deliverance of Noah can be viewed as a re-creation because



Figure 1. Vignette titled: “Formula for not dying a second time”. BOD chapter 175, papyrus of Ani, EA10470, c.1275 BC, early 18th Dyn. (Budge¹⁴)

God directs the cultural mandate of Genesis 1:28 to Noah and his offspring: ‘And God blessed Noah and his sons and said to them, ‘Be fruitful and multiply, and fill the earth’ (Genesis 9:1). That command is the same decree that the Hebrews were fulfilling in Exodus 1 as they multiplied and increased in Egypt. So the deliverance of Israel out of Egypt is being cast by the biblical writer as a re-creation.”¹²

Noah (and family) entered the ark (*tēbat*) on the 17th day of the second month (Genesis 7:11), which rested on Ararat the 17th day of the seventh month (Genesis 8:4) (the next year). Noah’s exit from the Ark (salvation from the Flood) and his restarting of the post-Flood civilization can be understood theologically as a resurrection/re-creation event. This may echo Plutarch’s testimony of Osiris’s entering his *dbn* on the 17th day of the third month, the season of Inundation, followed by his resurrection/re-creation. The Osiris bitumen mummy may share connections with the ‘pitch’ covering Noah’s Ark (Genesis 6:14). Admittedly, such evidence appears late in Egyptian history.

Motifs 5 a–d (7, 8) summary

When Horus’s father(s) are compared with Ham’s father, Noah, several striking connections can be made. Osiris’s association through (motif 5a) Geb with the earth, echoes Noah as the ‘man of earth’ bringing rest from the curse because of the cursed earth. Motif 5b, Osiris the ‘weary’ parallels Noah the ‘restful’. Motif 7, Noah enters the *tēbat* on the 17th of the second month, which rests on Ararat on the 17th of the seventh month of the Flood, resembles Osiris entering his *dbn* on the 17th of the Inundation month. Therefore, Osiris/Geb as Horus’s father(s) resembles Noah as Ham’s father.

Motifs 6–7. Ham vs Horus—journey in ark/bark through global Flood judgment

Genesis (7:7; 8:16–18) narrates how Noah’s family (including Ham) escaped judgment from the global Flood in Noah’s Ark. Can the same be said of Horus? BOD chapter 175 mentions a global Flood sent in judgment. Titled “Formula for not dying a second time”, the top left vignette image (figure 1) from the papyrus of Ani (18th Dynasty c. 1275 BC) is of the deceased Ani and his wife, worshipping Thoth (Lord of Khemnaw—the Ogdoad city).¹³

The context of the chapter makes clear, this flood was sent in judgment in response to the divine complaint made to Atum by Thoth regarding the “children of Nut” who had done “evil” and “rebellion”.¹⁵ Egyptologist H.M. Tirard explains:

“In the 175th chapter of the Book of the Dead mention is made of a deluge [*hwḥw*] that should overwhelm the earth The text goes on to represent Osiris as voyaging in the boat of the millions [*hh*] ... to the Isle of Flames, where Horus, his son, will inherit his throne.”¹⁶



Figure 2. Four sons of Horus as canopic jars

Image: British Museum / Public Domain

Egyptologist Edward Neville translated and commented extensively on this chapter, stating:

“... the god [Atum] is going to destroy what is on the surface of the earth by covering it with water, making it to be again Nu, the great ocean, the primitive water out of which everything originated. It will be Nu again as it was at the beginning”¹⁷

I demonstrated in my previous article,¹⁸ within BOD chapter 175, the Ogdoad names appear as scribal puns within the text: Nu (Primeval Ocean), Amun (hidden), Heh (millions), and Kek (darkness). Upon the Nu, sails the bark with Osiris, Horus (his son), Seth (brother), and Thoth (close associate/brother, see motif 8).¹⁹ Furthermore, the name of the bark *wiṣ-n-hh* (Wb 1, 271.11; 3, 153.15) is connected by phonetic-root to the Eight Chaos-gods (*hh*)—a version of the Ogdoad—named after Ogdoad couple *hh* and *hh.t*.

Genesis 6:15–16 give the ark’s dimensions (300 x 50 x 30 cubits). MK CT-759 gives the dimensions of the enormous Solar bark:

“A million [*hh*] (cubits) are a half of the length of the bark; starboard, bow, stern and larboard [port] are four million [*hh*] (cubits)”²⁰

Motifs 6, 7 summaries

Horus journeyed in the ‘Bark of Millions (*hh*)’ through a global flood of judgment with his father Osiris, brother Seth, and Thoth—is very reminiscent of Ham’s journey in the ark, surviving the Flood, with Noah and brothers.

Motif 8. Ham vs Horus—political, sexualized, brotherly enmity

Genesis (9:22, 24–27) informs us that Ham committed a serious sin against Noah, who lay naked and drunk in his

tent. The implications of Ham's crime—"seeing" and "telling his brothers" (9:22) have been debated for centuries. Various rabbinic speculations identify Ham's sins to include sodomy, emasculation and even castration of Noah. The last speculation account for Noah not fathering more heirs after Ham. Recent scholarship has suggested an attempted power grab through maternal incest involving Noah's wife and Ham—resulting in Canaan.²¹ However, Umberto Cassuto recognized Scripture deliberately "employs chaste language... [and] brevity" and he wisely admonishes:

"... we must not read into the Pentateuchal narrative more than it actually states, taking the words at their face value."²²

Noah's responding blessing and curse had political ramifications for his sons, regarding Shem and Japheth's dominance over Canaan. That Ham, in this episode, is called the "father of Canaan" twice is noteworthy (Genesis 9:18, 22). The nature of their sin is explained at Leviticus 18:3's admonition to Israel not to emulate the 'practices of the Egyptians and Canaanites' (cf. 18:24, 27, 28b)—listed as prohibitions against: incestualized family relationships (18:6–16); sexual immorality, perversion (18:17–20; 22, 23); and idol worship (18:21). This list specifically identifies these categories of sins as pertaining to Egypt and Canaan.

Scripture is silent regarding Ham's feelings towards his brothers. Naturally speaking, brotherly enmity would be expected in terms of Ham's jealousy and anger regarding the debasing of his son Canaan to be "a servant of servants" to Shem and Japheth (Genesis 9:25). In particular, towards Ham's older brother Shem (Genesis 9:26) who was specifically granted mastery over Canaan.

Concerning the earliest myths surrounding Horus—if he is the deified Ham—can similar motifs be discerned? Brotherly enmity? Struggle for political dominance? Sexual perversion,

incest? Egyptian speculations regarding emasculation/castration of Horus's father?

Similar motifs are indeed discernible within the Egyptian myth "The Contendings of Horus and Seth" (26th Dyn. Chester Beatty Pap. I, Oxford). This recounts the sordid, violent struggle between Horus and Seth, in regard to political succession to Osiris's throne. This is arbitrated by Thoth, the 'brother-like' god (lord of the Ogdoad city).

The festival of Khoiak (described in motif 5) was the prelude to this struggle. Seth had murdered Osiris, placing his body in the *dbn* chest, and floated it upon the water. The resulting fight between both opponents is violent; Horus loses an eye, and Seth his testicle—both organs should be viewed as political symbols. Later, according to the inscriptions, Horus is sodomized by Seth, in what appears to be a political manoeuvre to dominate Horus.²³

Motif 8 summary

It is this author's opinion that the Khoiak festival and "Contendings of Horus and Seth" represent a pagan polemic against the political situation that likely existed between Ham and his family. I propose that Shem was re-cast by the Egyptians as Seth the villain—who murdered Osiris and dominated Horus (sexually) in an attempt to steal the crown. In reality, Ham had 'violated' his father, in a sense, attempting a political subterfuge. As a result, Ham was placed in political subjugation (via his firstborn son Canaan) under his older brother Shem (Genesis 9:22–27). Ham likely had closer relations with his eldest brother Japheth, who, I propose, is re-cast as Thoth, who intervenes between Horus and Seth as peacekeeper. Political intrigue, sexualized violence (including Osiris's emasculation and Seth's partial castration) echoes somewhat the later rabbinic speculations regarding Ham's crime against his father and family.

Although such comparisons are speculative, these later festivals (which have their roots in PTs) may represent pagan-politicized reinterpretations of real biblical history, seen through the eyes of Ham and passed on down through the generations.

Motif 9. Ham vs Horus—four sons

Genesis 10:6 records that Ham had four sons (Phut, Cush, Mizraim, Canaan). Horus had four sons also, whose purpose was to restore the deceased pharaoh in the after-life and hold his internal organs within their four canopic jars (figure 2).²⁴ In *BOD* 141:4, they are associated with the four

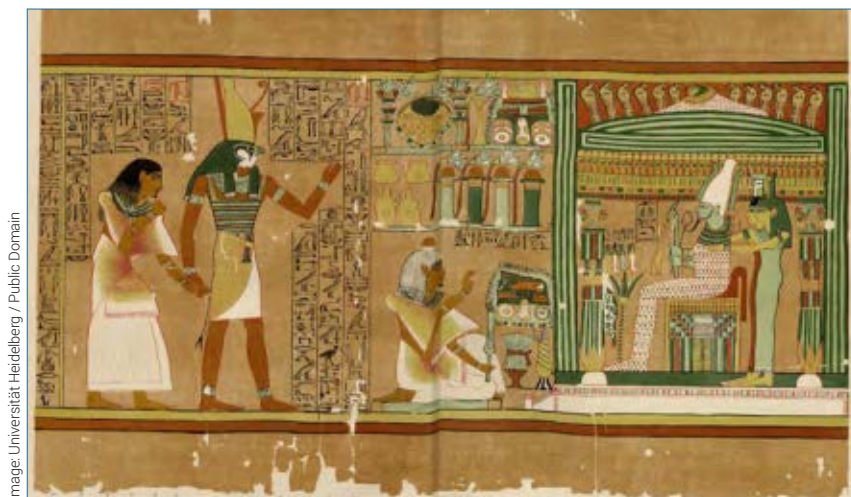


Figure 3. Horus and his four sons appear with Osiris within the BOD. Vignette from Hunefer BOD chapter 17, EA9901-3, c.1450 bc 19th Dyn. (Budge²⁶).

points of the compass. Within PTs they are named, for instance:

PT Pepis I, 580§1548a

“... the children of Horus, whom he loves: Hapi, Amset, Duamutef, Qebehsenuef.”

PT-688§2078–2079 is particularly noteworthy as it describes these four as “the children of Horus of Khem (*hr.w hm*).”²⁵

Horus’s four sons are pictured within Hunefer’s BOD. Egyptologist E.A.W. Budge gives the context of the vignette (figure 3):

“The god [Osiris] enthroned within a shrine ... in front a lotus-flower, on which stand the four children of Horus ... The throne of the god is set upon the waters [Nu] ... The address of Horus to Osiris, announcing the righteousness of Ani [the deceased] ...”²⁶

Motif 9 summary

Numerically, Horus’s four sons are consistent with Ham’s four sons. A further study is required to establish (any) linguistic connections between the meanings of these names.

Motif 10. Ham vs Horus—journey from the East

Genesis 11:2 states: “as people migrated from the east, they found a plain in the land of Shinar and settled there.” Here Ham’s grandson, Nimrod, fomented rebellion through the building of Babel and its tower. After YHWH confused their language, He “dispersed them from there over the face of all the earth ...” (Genesis 11:8). Geographically, Shinar is east of Egypt—being approximately 1,300 km (805 mi) away—measured from Cairo to modern Babylon Governorate. However, this would not represent the route Ham and his tribe would have followed to enter Egypt, because a vast wilderness of harsh desert and mountains would have required traversing. The other option would be by boat. Two possible routes are apparent (figure 4, green—north, red—south) measured using GoogleEarth™.

The northern (green) route is the shortest sailable route c. 1,846 km (1,147 mi), but would require transporting boats 188 km (117 mi) across mountains and desert in northern Syria—no easy task.

The southern (red) route navigates the Arabian Peninsula—total distance approximately 6,823 km (4,240 mi). The shortest available land crossing from the Red Sea (west coast, near Quseer) to the Nile Valley (near Luxor)—is approximately 142 km (88 mi).

Although over four times the distance of the northern route, the southern route would involve water most of the way and would therefore be the most practicable.

The implications of the biblical text imply the shortest land crossing by Ham’s tribe, coming from the east. Is there archaeological evidence consistent with this journey? Yes,

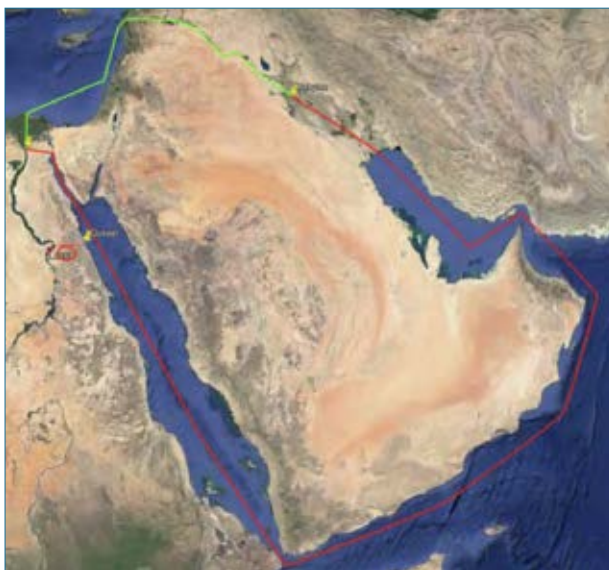


Figure 4. Red route represents Ham’s most practicable journey from Shinar. Site of Horus-square boat rock art (red ring).

and some striking pre-dynastic rock art indicates such a journey by the Shemsu Hor—the followers of Horus—took place as Genesis 11:2, 8 predicts. Archaeological sites (mid-way between Quseer and Luxor) (map—figure 4) possess many large Horus-insignia boat depictions (figures 6a, b). Egyptologist Hans Winkler²⁷ first described these, as more recently did Egyptologist David Rohl.²⁸ Rock images of distinctively square, flat keels, with high prows and sterns are strikingly similar in form to Uruk Period cylinder-seal boat depictions (4th millennium BC, from Sumer/Shinar) (figure 7).²⁹ The rock art is testament to a marine migration from the east, culminating in the dragging of large, seventy-manned vessels (figure 8) across the desert near Edfu, which became the centre of Horus worship.

Motif 10. Horus means ‘far distant one’, ‘from the east’.

OK PT divine epithets of Horus (*hr.w*) indicate, by a shared phonetic root, that his name means ‘far distant one’ (*hr.tj*). For instance:

Teti PT-370§645c–d

sja kw n hr.w j: ms k(w) jr=f m hri jr=f m rn k n(j) hr.t(j)

“Approach Horus; go to him [Osiris]. Do not be far from him in your name ‘One of the Far’.”

Horus is also ‘from the east’. For instance:

Unas PT-301§450c

jy.n (|wnjs|) hr=k hr.w-j3b.tj

“Unas has come to you, Eastern Horus.”

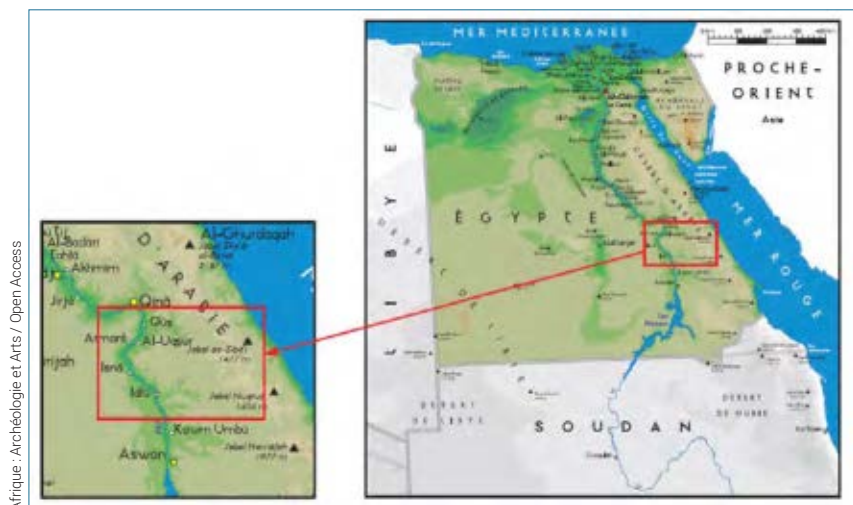


Figure 5. Petroglyph sites between Kawm Umbū (south) and Qina (north) with some west of the Nile³⁰

These divine epithets of Horus ('Distant One', "Eastern Horus") are consistent with Ham's approximately 7,000 km marine and land journey from Shinar in the east.

Motif 10 summary

Genesis 11:2, 9 indicate Ham and his tribe migrated from the East in Shinar to Egypt. The most practicable journey, by boat, would have involved the shortest land crossing, the closest point being the Red Sea coast (Quneer) to the Nile valley (Luxor/ Edfu). Nearby Pre-dynastic rock art demonstrates a large crew of Horus followers made such a journey, dragging their boats across the desert. That Horus came far, from the east, is demonstrated in PT divine epithets 'Eastern Horus' and 'Distant One' being titles consistent with Ham's journey. The boats' distinctively high prows, sterns, flat keel, fixed rear-oared forms of Sumerian origin likely become the religious iconography (Solar barks) of Egyptian art. Such became the new 'Noah's Arks', transporting Ham and his tribe from the old world to the new.

Motif 11. Ham vs Horus—eponymously name Egypt

Scripture eponymously links Egypt to Ham (Psalms 78:51; 105:23, 27; 106:22). The earliest hieroglyphic inscription (from OK onwards) for Egypt and its people, is *km.t*—phonetically similar (see part 1, phonetic considerations) to Hebrew *hām*, the feminine common noun *km.t* (so ends in .t) means the 'black land' (Wb 5, 127.4–127.17), which signifies the fertile, black Nile-flood soils. *Km.ti* "Egyptians", literally means "people of the black land" (Wb 5, 127.18–20). The connections between the black earthy products of Genesis 11:3; 14:10; Exodus 2:3 (*hēmār*, *hōmer*) and Egypt's "black land" (*km*) now become apparent (see part 1) as evidence consistent with Ham (*hām*) founding Egypt. The appellation for Egypt, *km.t*, occurs in OK PTs, e.g.:

Pyramid Pepis I., PT 674 + PT 462§1998b

ḥꜥ=k ḥntj km.t(j).w...

"You [Nephthys] will stand before the people of Egypt"

Ham the 'man of the black earth' accords well with Horus and the Egyptians of the 'Black Land'.

Athribis (*km*)

Situated approximately 40 km north of Cairo, on the eastern bank of the Nile, at Tell Atrib, (Athribis in Greek), 10th nome (territorial division) of Lower Egypt. Its original Egyptian name, *km-wr*, means "Great Black", the hieroglyphs of which include the black ox, *km*, and nome symbols:



Horus was worshipped at Athribis in his form of "the magnificent black bull" (LGG VII, 285). *Km-wr* occurs in OK PTs e.g.:

Teti PT-342§556b–c

m(j) m3=ṯ s3=ṯ phr n=f km-wr...

"Come and see your son, who is served by the (nome) Great black-bull"

Letopolis (*hm*)

Horus was also the god of Khem (*hm*)—being the name of the second nome of Lower Egypt—called Letopolis by the Greeks (*Λητοῦς Πόλις*). The city marked the centre of Horus worship in his form Khenty-khem, mentioned in PTs, e.g.:

Pyramid I 438§810a–b

ḥnh ḥnh n m(w)t=k js m(w)t.t mj ḥnh hr.w ḥnt(j) hm.

"Live, live—you certainly will not die—like Horus, who is at the head of *hm* [Letopolis] lives."


Textual evidence suggests a temple to Horus likely stood there from the foundations of Egyptian history.³¹ The following inscription suggests Horus names Egypt—which is called the 'two banks', because of the Nile River's two banks:

Pyramid of Pepi II, PT 439§812a

(*[ppy]*) (*[nfr-k3-rḥw]*) [*p*]w [*s*] *ṯ.t j ṯ.t t3 rkḥ.t šsp.t jdb=s.*

"This is Pepi Neferkare, (o) Satet, who takes possession of the two countries ... who receives their two banks [Egypt]."

Significantly, Horus is also called 'two banks', so eponymously linking him directly to Egypt: *jdb.wj-hr.w* "the two banks of Horus (Egypt)" (Wb 1, 153.7). Here, Egypt

is depicted with two bank symbols and Horus the falcon:
 For example:

(Ptolomaic) [Papyri of Nesmin from Thebes, pBM 10208](#)

sb hr m hcc.

“The shores of **Horus** (Egypt) are (then) in jubilation!”

[PT-532§1258](#)

hr.w nb-t3(.wj).

“**Horus**, Lord of the Two Lands.”³² Horus, therefore, is as synonymous with Egypt as biblical Ham is.

A common OK term (exactly phonetically equivalent to Ham), is ‘*hm*’ meaning ‘majesty (of the king, or god)’ (Wb 3, 91.1–92.11). *Hm* is also used of Horus, as an epithet; for instance:

12th Dyn. (1971–1926 BC) [Sesostris I Month Temple of Tod, Column 32](#)

hm hr “... the **majesty** of **Horus**”

Motif 11 summary

Ham (*hām*) eponymously named Egypt (Psalms 78:51; 105:23, 27; 106:22) and Horus eponymously names Egypt (*km.t*) and two nomes as patron deity and majesty, with phonetically related names to Ham (*km*, *hm*, *hm*).

Motif 12. Ham vs Horus—lived to great ages

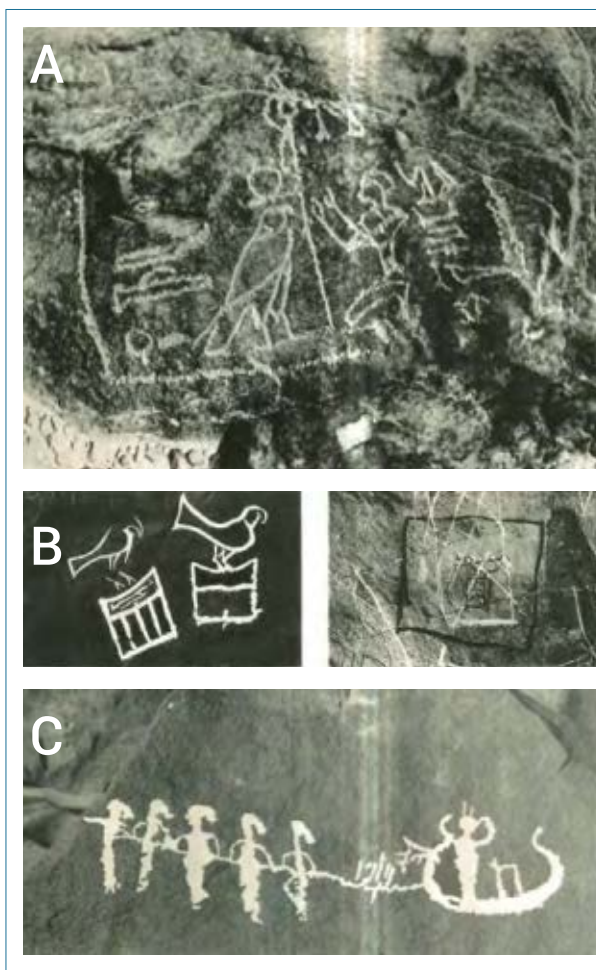
Genesis 11:11 indicates Shem lived 600 years—nothing in Scripture suggests Ham lived a shorter lifespan. If Horus is the deified Ham, is Horus commemorated as an ancient elder-deity? Yes. In [PT 303§466a](#) Horus is called ‘the eldest god’. A Horus divine epithet is *Hr.w-sms.w* means “Horus the Elder” (LGG V, 290) occurring in ([PT-256§301b](#)). As already noted in article-1, BOD chapter 19 (22nd Dynasty) states: “Horus the son of Isis and the son of Osiris has repeated millions of jubilees” These epithets indicate Horus was considered an ancient deity—consistent with Ham living to a great age.

Conclusion

My two articles have investigated 12 motifs of Ham’s life drawn from Genesis 5–11, compared with Horus (table 1).

Part 2 has concentrated on motifs 5–12, summarized here:

- Motif 5—Ham’s father, Noah, vs Horus’s father(s), Osiris/Geb, reveals the following connections: ‘rest’ vs ‘weary’, “man of the earth” vs “earth-god”. Furthermore, Osiris is synonymous with Ogdoad Nu—a paganized memory of Noah.
- Motif 6—Noah entered the ark (*tbt*) on the 17th vs Osiris entered the chest (*dbn*) on the 17th.



Figures 6a–c. Square boat and Horus insignia rock art (Winkler²⁷)

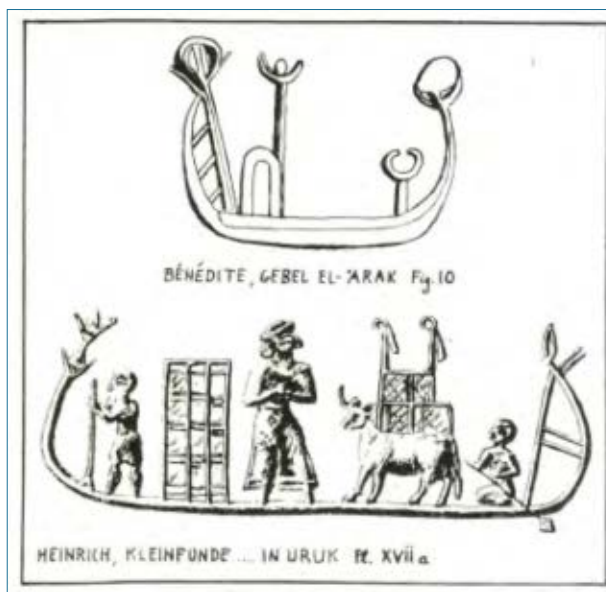


Figure 7. Winkler²⁷ compares Uruk (Sumer/Shinar) and Egyptian rock art boats.

Hans Alexander Winkler / Open Source

Hans Alexander Winkler / Open Source

Table 1. Motifs 1–12 of Ham’s life drawn from Genesis 5–11, compared to Horus and Egyptian evidence

#	Ham: biblical motif	Ham: Description	Genesis ref.	Horus: Egyptian motif	Horus: Description	Primary Egyptian source
1	11th from Adam	Ham’s genealogy places him 11 th from Adam, patriarchs who lived to great ages	5:1–32	Horus 11 th from Atum, who are all elder-deities	The Great Ennead [including Osiris] places Horus 11 th from Atum, who reigned for centuries	PT-219§167–177, Turin Canon, columns 1, 2
2	Name etymology	Name/character connected with concepts of (physical) ‘violence’, (earthy) ‘blackness’, (sun’s) ‘heat’	6:11; 8:22; 11:3	Divine epithets of Horus	Name/character connected with concepts of (physical) ‘violence’ (<i>kk</i>), (earthy) ‘blackness’ (<i>km</i>), (sun’s) ‘heat’ (<i>hh</i>)	PT-292§433a, CT-885, PT-600§1657a–1658d, PT-313§503a–503b
3	Family of eight	Four males and their wives	6:18; 7:7, 13	Horus connected to eight gods—Ogdoad	Horus connected to Ogdoad god ‘ <i>kk</i> ’ (darkness), and ‘Chaos-gods’ (<i>hh</i>)	EA9901-8 (BOD-17), EA10470 (Ani Papyrus), CT-50:223–225
4	3 brothers, total	Ham (youngest), Shem, Japheth (eldest)	5:32; 6:10; 7:13 etc.	Three brothers, total	Horus (youngest brother), Seth (brother), Thoth (brother)	PT-539§1320c, PT-615§1742a, PT-218§163d, CT-681
5	Father Noah	Noah (name means “comfort/rest” from cursed earth)	5:29–32; 6:8–10 etc.	Father(s) Osiris/Geb	Osiris means “Tired/Weary/Inert One” (<i>nn</i>); Geb (<i>gbb</i>) earth-god	CT-431 (cf. PT-578§1534a), PT-478§973a
6	Ark (300 x 50 x 30 cubits)	Noah (and family) entered Ark (<i>tebat</i>)/rested 17th of month	6:15–16; 7:11; 8:16–18	Solar bark million (<i>hh</i>) cubits	Osiris entered chest (<i>dbn</i>) on 17th of Inundation month	CT-759; PT-219§179–184; Koliak Festival, Plutarch. (13, 356C-D; 69, 378E).
7	Flood	Global Flood judgment, Ham, father, two brothers in ark	6:17	Horus survives global flood, sent in judgment	Global Flood judgment, Horus, father, two brothers in ark	BOD-175
8	Noah’s curse and blessings	Ham’s sin [implied brotherly enmity], perversion [even castration, emasculation (rabbinic speculation)] debased political position	9:22, 24–27 cf. Leviticus 18:3–30	Seth’s sin, brotherly enmity with Horus, perversion, [even castration/emasculation (Egyptian speculation)] Seth’s debased political position	Seth murders Osiris, cutting body into parts, loses phallus. Castrates Horus, sexually abuses him. Seth conquered.	Contendings of Horus and Seth, Chester Beatty Pap. I, Oxford, Koliak Festival
9	Ham’s four sons	Cush, Mizraim, Phut, Canaan	10:1	Horus’ four sons	Hapi, Amset, Duamutef, Qebehseuef	PT-580§1548a
10	Journeyed from East to Shinar	After Babel YHWH scattered humankind (including Ham and sons)	11:2, 8–9	Horus means “from afar”, “Eastern Horus”	Pre-Dynastic rock art shows Horus emblem boats being dragged across desert into Nile valley	PT-370§645c–d, PT-301§450c, Kom Ombo—Qena archaeological sites
11	“Land of Ham”	Ham (<i>hm</i>) eponymously names Egypt	Psalms 105:23 etc.	Horus eponymously names Egypt and two nomes	Horus and Egypt are “Two Banks”, Horus god of Athribis (<i>km</i>), Letopolis (<i>hm</i>) and majesty (<i>hm</i>)	PT-532§1258, PT-342§556b–c, PT-438§810a–b
12	Lived to great age	Ham likely lived to similar age as brother Shem	11:11	Horus an elder-deity	Horus the Elder (<i>Hr.w-wr</i>)	PT-303§466; PT-256§301b



Image: F. Lankester

Figure 8. Pre-dynastic rock art at Wadi Baramiya-9, Central Eastern Desert, Egypt, depicting a seventy-manned Horus 'square boat' being dragged across desert (Lankester³⁰, figure 7)

- Motif 7—Ham's family in the Ark surviving the Flood echoes Horus, Osiris, Thoth, and Seth in the Solar bark in the Nun (BOD-175).
- Motif 8—Noah's curse and blessings may be polemically reversed in the Khoiak festival and Contendings of Horus and Seth.
- Motif 9—Horus's vs Ham's four sons.
- Motif 10—Genesis 11:2, 9 predicts Ham's tribe migrated from the East, specifically Shinar to Egypt. Pre-Dynastic rock art demonstrates a journey was made across the desert to the Nile by followers of Horus.
- Motif 11—Egypt is named after Ham, and Egypt (including two nomes) are named after Horus.
- Motif 12—Ham likely lived long, and Horus possesses elder-deity epithets.

It is my opinion that the combined evidence presented in both articles supports the hypothesis that the Ancient Egyptians deified Ham as Horus. The evidence (admittedly some more speculative to interpret) is consistent with the historical events of Genesis 5–11. Ham, a Flood survivor, helped re-start civilization, founded Egypt, and lived to a great age. The pagan Egyptians therefore deified Ham as Horus—one of Egypt's most important and oldest deities.

Acknowledgments

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The chronology of the Law and the Prophets as a twofold witness to biblical inerrancy

Rena Beckman

"Great are the works of the Lord, studied by all who delight in them" Psalm 111:2 (ESV).

The Old Testament contains numerous verifiable details that demonstrate its historical accuracy. These are externally consistent with records from surrounding nations and internally consistent across two biblical counting systems, the regnal year records of Divided Kingdom rulers and the calendar system of Sabbatical and Jubilee years. This article examines the multilayered verification of these chronological details, not just for dates in the Divided Kingdom, but also for earlier dates in Israel's history. It traces the efforts begun by Thiele in 1944 and completed by Young in 2004. Thiele's modified chronology is compared to alternatives advocated by Pierce and Austin in the *Journal of Creation*. Most importantly, this paper explores how a topic like chronology supports the message of the Gospel.

Starting with the Bible—two witnesses in the Old Testament

In the New Testament, the Old Testament is called 'the Law and the Prophets' or 'Moses and the Prophets'. The first part of that title, the Law, encompasses the first five books of the Bible, written by Moses at the time the nation of Israel was entrusted with rules to set them apart as God's people. The second part of the title, the Prophets, covers a collection of works by God's spokespeople, including records of the history of the Hebrew nation. Within the Law, besides the time spans found in chronogenealogies and patriarchal age statements, there is chronological information in the Sabbatical and Jubilee calendar system. The Prophets also supply time spans, but add regnal year records and synchronisms as well. As would be expected from the Bible, since it is authored by God, the dates produced by each method correlate exactly with each other, providing a detailed, verifiable, and internally consistent chronology (figure 1).

Thiele's development of biblical chronology for the Divided Kingdom period

One of the most well-known biblical chronologists is Archbishop James Ussher, who published a two-volume biblical and secular history in Latin in 1650 and 1654, called *The Annals of the World*.¹ Ussher was followed by Edwin Thiele (TEE-luh), who also used biblical data, but had Assyrian and Babylonian sources not available in Ussher's time. Thiele's work analyzed the Divided Kingdom,² first through a journal article in 1944,³ then a book, *The Mysterious Numbers of the Hebrew Kings*, in 1951.⁴ Thiele's thorough analysis, plus additional archaeological data, shed new light on biblical dating.

First, Thiele realized that Judah started its calendar year in autumn with the 7th month by biblical numbering, Tishri, while Israel began its year with the 1st month, Nisan, which falls in spring.⁵ The biblical basis for a Tishri calendar year came from details on Solomon's construction of the temple⁶ and Josiah's activities prior to Passover in his 18th year.⁷ In contrast, Ussher had assumed that both Israel and Judah began their year with Nisan, possibly following the Talmud.⁸ (For notational clarity, Tishri years will be designated with a 't' next to the BC year in which it began, and Nisan years with an 'n'. The 1st half of the year will be labelled '1' and the 2nd half '2'.)

Second, Thiele noticed that two methods of counting regnal years were employed in the Bible, observing that synchronisms between the two kingdoms developed a discrepancy that increased by one year with each new king in Israel during the early years of the Divided Kingdom. Thiele, familiar with the Assyrian data covered in Luckenbill's comprehensive two-volume publication,⁹ examined the Assyrian Eponym Canon,¹⁰ the Kurkh Monolith (figure 2),¹¹ and the Black Obelisk (figure 3).¹² The Assyrian records showed a passage of only 12 years where two Israelite kings took credit for 14 regnal years. The comparisons revealed that Israel used 'non-accession reckoning' at the time, double counting a transition year to both the outgoing and incoming ruler, calling it 'year one' for the new ruler. Judah, on the other hand, employed 'accession reckoning' at that point, attributing the transition year solely to the outgoing ruler, and labelling the new ruler's initial year an 'accession year'. A king's 'year one' in this system began with the New Year (whether Tishri or Nisan) following the transition year. With non-accession reckoning, a reign length or ordinal year synchronization is always formulated as $x - 1$ from the transition year. For example, if Jeroboam I of Israel started to reign

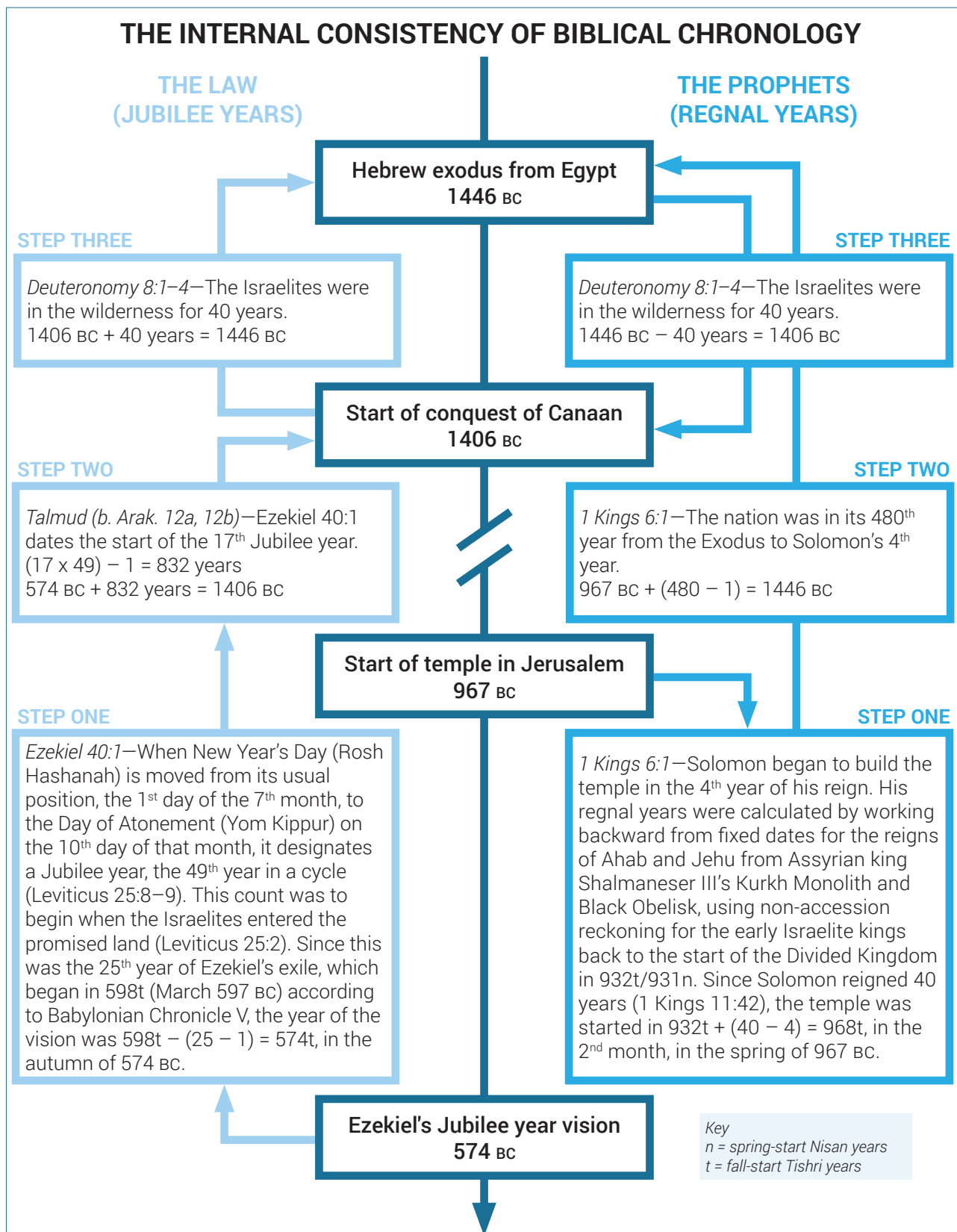


Figure 1. Tying in chronology with Jubilee and regnal years



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Figure 2. Kurkh Monolith of Shalmaneser III: This large limestone stela (221 x 87 cm or 7.25 x 2.85 ft) mentions Ahab as an adversary at the Battle of Qarqar in 853 BC. It is also called the Kurkh Stela or Monolith Inscription and is identified by British Museum number 118884.



Image: Osama Shukir Muhammed Amin FRCP(Glasg)/CC BY-SA 4.0

Figure 3. Black Obelisk of Shalmaneser III: This large limestone obelisk (197 x 45–61 cm or 6.46 x 1.48–2.00 ft) lists tribute from Jehu, which according to Shalmaneser's annals was received in 841 BC. Its British Museum number is 118885.

in 931n and ruled 22 years, his end date is $931n - (22 - 1) = 910n$. If Abijam of Judah started his reign in the 18th year of Jeroboam I, then the synchronization is $931n - (18 - 1) = 914n$ (table 1 and supplementary tables 2a and 2b).¹³

Third, Thiele found coregencies and overlapping reigns missed by others. Two key examples are Azariah's/Uzziah's coregency with his father Amaziah in Judah and a 12-year rivalry in Israel in which Menahem's and Pekahiah's reigns overlapped the first part of Pekah's 20-year reign. Initially, Thiele suggested that Pekah had backdated his reign to take credit for those years,¹⁴ but after 1964, when H. J. Cook pointed out the prophet Hosea's distinction between two parts within Israel,¹⁵ Thiele specifically accepted Hosea 5:5 as evidence of a rival reign instead.¹⁶

Chronologists who deny Azariah's/Uzziah's coregency and Pekah's rivalry are forced to place two interregna in Israel's history to fit synchronisms together, but the reign of Assyrian king Tiglath-Pileser III makes this impossible. First, Tiglath-Pileser mentions Azariah/Uzziah as part of an allied group in revolt against him.¹⁷ Second, according to 2 Kings 15:19, where Tiglath-Pileser is called Pul, he received tribute from Menahem. (Pul is another name for Tiglath-Pileser according to 1 Chronicles 5:26¹⁸ and Thiele's

comparison¹⁹ of Babylonian Chronicle I²⁰ to Ptolemy's Canon.²¹) Tiglath-Pileser's annals²² also list this tribute. Third, Tiglath-Pileser claims he replaced Pekah with Hoshea, allowing no passage of time between them.²³ The reigns of Azariah/Uzziah, Menahem, Pekah, and Hoshea only align with Tiglath-Pileser's records if the aforementioned coregency and rivalry are recognized (supplementary table 3).

Finally, Thiele's expertise in archaeology, combined with the work of Olmstead,²⁴ connected the biblical data on the fall of Samaria to corroborating historical sources. This tragedy, described in 2 Kings 17:3–6, 18:9–11, connects the final years of Hoshea's reign to the military campaign of Assyrian king Shalmaneser V. A badly mutilated portion of the Assyrian Eponym Canon states Shalmaneser was against an unnamed adversary for the years 725–723n, which coincides with the three-year siege against Samaria in Hoshea's 7th to 9th years. An additional source confirmed this connection: Babylonian Chronicle I credited Shalmaneser with destroying Samaria.²⁵

Thiele's chronology beautifully tied together most of the regnal year synchronisms of the Divided Kingdom and also connected seamlessly to multiple checkpoints in secular history. As Thiele himself put it:

Table 1. External corroboration of biblical chronology

Thiele's date correlations to secular history with McFall's and Young's modifications					
Judahite king	Adjusted reign length	Dates	Israelite king	Adjusted reign length	Dates
Rehoboam	17 years (SA)	932–915t	Jeroboam I	22 – 1(SN) = 21 years	931–910n
Abijam/Abijah	3 years (SA)	915–912t	Nadab	2 – 1(SN) = 1 year	910–909n
Asa	41 years (SA)	912–871t	Baasha	24 – 1(SN) = 23 years	909–886n
Jehoshaphat	17 th year sole reign (SA)	871–854t	Elah	2 – 1(SN) = 1 year	886–885n
Jehoshaphat began a coregency with his father in 873t, when Asa's feet became diseased.			Zimri	7 days = 0 years	885–885n
			Tibni	rival 6? (1 Kings 16:21–23) = 0 years	885–880n
			Omri	12 – 1(SN) = 11 years	885–874n
			Ahab	22 – 1(SN) = 21 years	874–853n
Total year span	78 years	78 years	Total year span	78 years	78 years
854t2/853n1					
Kurkh Monolith, Shalmaneser III's 6 th year, 853 bc, Ahab at Battle of Qarqar before his death in Ramoth–gilead					
Jehoshaphat	25 = 3(CN) + 22(SA) [5 left]	854–849t	Ahaziah	2 – 1(SN) = 1 year	853–852n
Jehoram/Joram	6(CN) + 8 – 1(SN) = 7 years	854–842t	Jehoram/Joram	12 – 1(SN) = 11 years	852–841n
Ahaziah*	2(CN) + 1 – 1(SN) = 0 years	843–842t			
Total year span	12 years	12 years	Total year span	12 years	12 years
842t2/841n1					
Black Obelisk, Shalmaneser III's 18 th year, 841 bc, Jehu's tribute after killing the kings of Judah and Israel					
Queen Athaliah	7 – 1(SN) = 6 years	842–836t	Jehu	28 – 1(SN) = 27 years	841–814n
Joash/Jehoash	40 – 1(SN) = 39 years	836–797t	Jehoahaz/Joahaz	17 – 1(SN) = 16 years	814–798n
Amaziah	6(SA) + 23 under son = 29(A)	797–768t	Joash/Jehoash*	2(CN) + 16 years (SA)	799–782n
After his capture by Jehoash of Israel, Amaziah may have been seen as secondary to his son.			Jeroboam II	41 = 12(CN) + 29 years (SA)	793–753n
Azariah/Uzziah	52 = 24(CN) + 28(SA)	791–740t	Zechariah	6 months = 0 years	753–753n
Jotham	20 = 12(CN) + 4(SA) + rival 4 [8 yrs]	751–732t	Shallum	1 month over Nisan 1 = 1 year	753–752n
A political faction for Assyrian appeasement likely considered Jotham deposed after 16 years of reign, when his son's coregency began (2 Kings 15:30–33).			Menahem	rival 10 = 0 years	752–742n
Ahaz	5(CN) + 8 of 16(SA) [8 years]	736–724t	Pekahiah	rival 2 = 0 years	742–740n
2 Kings 17:1 treats Ahaz as sole ruler in 736t.			Hosea 5:5 makes Israel and Ephraim two kingdoms.		
Hezekiah	6 th yr = 6 – 1(CN) = 5 years [0 yrs]	729–724t	Pekah	20 years (SA)	752–732n
			Hoshea	9 years (SA)	732–723n
			2 Kings 17:1 ties to the end of Hoshea's reign.		
Total year span	118 years	118 years	Total year span	118 years	118 years
724t2/723n1					
Babylonian Chronicle I, Shalmaneser V "ravaged Samaria" in 723 bc					
Assyrian Eponym List, Shalmaneser V, "campaign against [Samaria]," 725–723n, and 2 Kings 18:9–10					
Judahite king	Adjusted reign length	Dates	Assyrian and Babylonian records		
Ahaz	5(CN) + 8 of 16(SA) [8 left]	724–716t	Sennacherib's Annals/Prism, 701 bc, Hezekiah's 14 th (SA)		
Hezekiah	8 of 14(CN) + 29(SA)	724–687t			
Manasseh	55 = 11(CN) + 44(SA)	697–643t			
Amon	2 years (SA)	643–641t			
Josiah	31 years (SA)	641–610t	Babylonian Chronicle III, Josiah's death Babylonian Chronicle III, Jehoahaz's captivity Babylonian Chronicle III, Jehoiakim's accession Babylonian Chronicle V, Jehoiachin's captivity Babylonian Chronicle V, Zedekiah's accession		
Jehoahaz	3 months over Tishri 1 = 1 year	610–609t			
Jehoiakim	11 years (SA)	609–598t			
Jehoiachin/Jeconiah	3 months = 0 years	598–598t			
Zedekiah	11 – 1 = 10 years (SN)	598–588t			
Total year span	136 years	136 years			
588t2/587n1					
Calculations based on date of Jehoiachin's exile, when Ezekiel was also taken captive, from Babylonian Chronicle V					
Cross-checked by Babylonian inscriptions from the reigns of Nebuchadnezzar II and Evil–Merodach (Amel–Marduk)					
S = sole reign, C = coregency, N = non–accession reckoning, A = accession reckoning, <i>numbers</i> = reign lengths in Bible, t = Tishri (fall–start) years, n = Nisan (spring–start) years, 1 = 1 st half, 2 = 2 nd half, *McFall's coregency suggestion is accepted here although omitted by Young					

“The best argument for the correctness of [the proposed chronology] is that it works, giving us a chronological scheme of the kings of Israel and Judah in which there is internal harmony and which fits into the chronology of neighboring states.”²⁶

McFall's contributions to Thiele's chronology

British scholar Leslie McFall fixed some of the issues remaining in Thiele's work.²⁷ First, he updated Thiele's chronology by adding a coregency, first suggested by Siegfried Horn in 1964, for Hezekiah and Ahaz.²⁸ Second, McFall accepted a different translation of the verb form of 2 Kings 17:1, an idea originally offered by Edmund Parker in 1968.²⁹ The verb for 'reign' in this passage is usually translated as 'began to reign'. It should instead read that Hoshea of Israel 'had reigned' in Samaria for nine years.³⁰

These two adjustments fixed two synchronisms. The Assyrian siege of Samaria during the 7th to 9th years of Hoshea of Israel corresponded with the 4th to 6th years of Hezekiah's coregency (2 Kings 18:9–10). Also, the end of Hoshea's reign, his 9th year, ties to the 12th year of Hezekiah's father, Ahaz (2 Kings 17:1), when Ahaz is treated as a sole ruler who deposed his father, Jotham.³¹

Young's technological experience applied to biblical chronology

The next contributor to biblical chronology, Rodger Young, came from the computer industry. By employing data analysis methods used there, he discovered that the calendar system of Sabbatical and Jubilee years found in the Law aligned with the regnal year systems recorded by the Prophets, providing internal verification of the accuracy of the biblical historical record.

First, Young made a correction to the date of Solomon's death, placing it in 932t rather than 931t as suggested by Thiele.³² This, in turn, fixed the math applied to 1 Kings 6:1, where the start of temple construction in Solomon's 4th year was the 480th year after the people left Egypt. Solomon reigned 40 years (1 Kings 11:42), so his 4th is 932t + (40 – 4) = 968t. The regnal year began in autumn, but the temple was started the following spring, in 967 BC. The 480th year places the 1st year in 968t + (480 – 1) = 1447t.³³ This Tishri year started in autumn, but the Israelites left Egypt in the spring-time month of Nisan, in 1446 BC. The synchronism, worked out by Young, established the regnal year side of figure 1.

In regard to the 480-year figure, it cannot be modified by adding to it or treating it symbolically. Rabbi Umberto Casuto observed that in the Hebrew text, if a figure appears in ascending order, for example, with tens before hundreds, this designates a technically exact and precise figure.³⁴ Archaeologist Bryant Wood noted that 1 Kings 6:1 reads as the 80th and 400th year, pinpointing a meticulously accurate number.³⁵

Next, Young turned his attention to the Bible's Jubilee year calendar system and the Talmud's identification of two Jubilee years,³⁶ one in the 18th year of Josiah³⁷ and another in the year identified in Ezekiel 40:1, which the Talmud numbers as the 17th Jubilee (supplementary tables 4a and 4b).³⁸ Josiah's Jubilee precedes Ezekiel's by 49 years, making it the 16th.³⁹

The Jewish religious calendar, like civil regnal year systems, had both Nisan and Tishri years. The religious year began in Nisan, the 1st month, but Sabbatical and Jubilee years began in Tishri, the 7th month.⁴⁰ This meant that Sabbatical years began with the 2nd half of the 7th Nisan year and finished midway through the 8th Nisan year, which was the 1st Nisan year of the next cycle (Leviticus 25:20–22). Jubilee years, being concurrent with the 7th Sabbatical year, ran through the 2nd half of the 49th Nisan year and the 1st half of the 50th Nisan year, meaning the 1st Nisan year of the next cycle (Leviticus 25:8–12).

The count began when the Israelites entered Canaan (Leviticus 25:1–8). Seventeen cycles back from Ezekiel's Jubilee is 574t + [(49 × 17) – 1] = 1406t.⁴¹ The Tishri year started in the 2nd half of the Nisan year, which places the entry to Canaan in 1406n (Joshua 4:19). This synchronism established the Jubilee year side of figure 1. Young also found allusions to other Sabbatical and Jubilee years in Scripture (table 4a).⁴²

The Sabbatical and Jubilee cycle marked by Ezekiel 40:1 is not in alignment with Ussher's count, seemingly determined by working backwards from known post-exilic Sabbatical years. The problem with Ussher's approach is that the first Jewish exiles to return to Jerusalem apparently started a new Sabbatical year count upon arrival, based on Nehemiah 10:31, the Seder 'Olam,⁴³ and the Talmud,⁴⁴ so the post-exilic count does not align with the pre-exilic count (supplementary table 4b).

Young's analysis of Judahite kings and the attacks on Jerusalem

Young then focused on the date of Jerusalem's destruction by the Babylonians.⁴⁵ Using a tool called decision tables⁴⁶ to analyze chronological data from Ezekiel, 2 Kings, and Jeremiah, he discovered that Jerusalem fell in the summer months of 587 BC, not 586 BC as proposed by Thiele.

Jerusalem was attacked three times during the last days of Judah. First in 605 BC, when Daniel was taken captive to Babylon, then in 597 BC, when Ezekiel and King Jehoiachin were taken, and finally in 587 BC, when Jerusalem and its temple were destroyed. These dates are all determined by comparison of biblical data with Babylonian records.

Young's analysis began with Ezekiel and a chronological peg from the start of his captivity, dated by Babylonian Chronicle V (figure 4).⁴⁷ It states that in Nebuchadnezzar II's 7th year, 598n, on the 2nd day of the 12th month (which Parker

Table 4a. Old Testament allusions to Sabbatical and Jubilee years

Young's analysis of Old Testament allusions to Sabbatical and Jubilee years	
Dates and practices	Synchronisms, calculations, and historical connections
<p>11th Jubilee (868t)</p> <p>868t 1406 BC – [(11 x 49) – 1] 1406 BC entry to Canaan is 'year one' so date formula must be reduced by 1 for first cycle</p> <p><i>Reading the Law (Deuteronomy 31:10–13)</i></p>	<p>Kurkh Monolith sets Ahab's last year in 853n, and Jehoshaphat's 17th year in 854t (1 Kings 22:51) 854t + 17 = 871t (Jehoshaphat's accession year) 3rd (SA) year of Jehoshaphat of Judah 871t – 3 = 868t (2 Chronicles 17:7–9)</p>
<p>Sabbatical year (700t)*</p> <p>721t start of 14th Jubilee = 1406 BC – [(14 x 49) – 1] 21 3 x 7 (three Sabbatical cycles) 700t Sabbatical year 28 4 x 7 (four Sabbatical cycles) 672t start of 15th Jubilee</p> <p><i>Land lying fallow (Leviticus 25:1–7)</i></p>	<p>Sennacherib's Prism sets the Assyrian invasion in 701 BC, in the 2nd half of Hezekiah's 14th (SA) year (702t2/701n1), crop disruption continued into 701t and Hezekiah received God's promise of food for that year and the 700t Sabbatical year (2 Kings 18:13, 19:29; Isaiah 36:1, 37:30)</p>
<p>16th Jubilee (623t)</p> <p>672t start of 15th Jubilee = 1406 BC – [(15 x 49) – 1] 49 7 x 7 (seven Sabbatical cycles) 623t start of 16th Jubilee = 1406 BC – [(16 x 49) – 1]</p> <p><i>Reading the Law (Deuteronomy 31:10–13)</i></p>	<p>Babylonian Chronicle III sets Josiah's death in 610t, which places his accession year in 641t (2 Kings 22:1, 23:29, 2 Chronicles 34:1, 35:20–24) 18th (SA) year of Josiah of Judah = 641t – 18 = 623t (2 Kings 22:3, 23:2, 23) Seder 'Olam, Ch. 24; Talmud, b. Megilah/Megillah 14b</p>
<p>Sabbatical year (588t)—Fall of Jerusalem</p> <p>623t start of 16th Jubilee = 1406 BC – [(16 x 49) – 1] 21 3 x 7 (three Sabbatical cycles) 602t Sabbatical year (next cycle year 1 = 601n, year 2 = 600n, year 3 = 599n, year 4 = 598n) 14 2 x 7 (two Sabbatical cycles) 588t Sabbatical year 14 2 x 7 (two Sabbatical cycles) 574t start of 17th Jubilee = 1406 BC – [(17 x 49) – 1]</p> <p><i>Later tradition of freeing servants in a Sabbatical year rather than at the end of six years of service (Exodus 21:2; Deuteronomy 15:9, 12)</i></p>	<p>Babylonian Chronicle V sets Nebuchadnezzar's accession year in 605n and Zedekiah's in 598n2/598t1 (16 March 597 BC) Zedekiah began to reign in the 4th year of a Sabbatical cycle (Jeremiah 28:1, Seder 'Olam, Ch. 25) Jerusalem destroyed: 11th (SN) year of Zedekiah of Judah (2 Kings 25:2, Jeremiah 39:2, 52:5) = 598t – (11 – 1) = 588t (588t2/587n1) 19th non-accession year of Nebuchadnezzar (2 Kings 25:8–9, Jeremiah 52:12) = 605n – (19 – 1) = 587n (588t2/587n1) Seder 'Olam, Ch. 30; Talmud, b. Arachin/Arakhin 11b, 12a</p>
<p>17th Jubilee (574t)</p> <p>623t start of 16th Jubilee = 1406 BC – [(16 x 49) – 1] 622n 'year one' after 16th Jubilee 29 calculate 'year 30' from 'year one' 593n 30th year (594t2/593n1) 19 remainder of years until Jubilee 574t start of 17th Jubilee = 1406 BC – [(17 x 49) – 1]</p> <p><i>Year starting on Tishri 10 (Leviticus 25:8–9)</i></p>	<p>Babylonian Chronicle V sets Jehoiachin's/Ezekiel's exile in 598t (16 March 597 BC), 5th year of exile equated to 30th year of a Jubilee cycle 598t – (5 – 1) = 594t or 594t2/593n1 (Ezekiel 1:1–2) 25th year of Ezekiel's exile (Ez. 40:1) = 598t – (25 – 1) = 574t (598t is 'year one'); 14 years <i>after</i> fall of Jerusalem (Ezekiel 40:1) = 588t – 14 = 574t (588t is 'year zero'), Seder 'Olam, Ch. 11; Talmud b. Arachin/Arakhin 12a, 12b</p>
<p>bold = Sabbatical, Jubilee, or numbered year date, <i>italic</i> = practices connected with Sabbaticals/Jubilees, t = Tishri (fall-start) years, n = Nisan (spring-start) years, S = sole reign, A = accession reckoning, N = non-accession reckoning, *One- and two-invasion theories in Young, Seder Olam, Part II</p>	

and Dubberstein dated as 16 March 597 BC),⁴⁸ Nebuchadnezzar took an unnamed king of Judah captive and placed another on the throne. The Bible identifies the exiled king as Jehoiachin, taken after only three months of reign, and the new king as Zedekiah, his uncle (2 Kings 24:8–17). Ezekiel was also taken at this time since he refers to ‘our exile’ in Ezekiel 33:21, 40:1. Young noted that 2 Kings 24:12 dated this event by non-accession reckoning to Nebuchadnezzar’s 8th year. In contrast, an addendum to the book of Jeremiah, written by someone other than the prophet (Jeremiah 51:64), placed the exile by accession reckoning in Nebuchadnezzar’s 7th year (Jeremiah 52:28). By either method, the event took place in the last month of 598n. Since the 2nd half of 598n overlaps the 1st half of 598t, and the end of Jehoiachin’s three-month reign fell on the last month of that six-month period, then all of his reign fell within 598t. This also meant the reign of his predecessor, Jehoiakim, ended in 598t. He ruled 11 years (2 Kings 23:36), so the furthest back in time his reign could have begun would be $598t + 11 = 609t$. That determined that Jehoiakim’s predecessor, Jehoahaz, was taken captive by Egyptian pharaoh Neco/Necho II in 609t, after reigning only three months (2 Kings 23:31–34). But Jehoahaz’s father, Josiah, started in 641t and reigned 31 years (2 Kings 22:1), so his rule, with accession reckoning, could only extend as far as 610t, since $641t - 31 = 610t$. Thus Jehoahaz’s three-month rule began in 610t and crossed Tishri 1 into 609t.

Josiah’s death in 610t is corroborated by Babylonian Chronicle III.⁴⁹ It says that in the 1st half of 609n (the 2nd half of 610t), Egyptian and Assyrian forces crossed the Euphrates in the 4th month to try to reclaim a city recently lost, but they seemed to have left by the 6th month. This aligns with biblical details, that as Neco/Necho travelled through Israel’s former territory to join the Assyrian army, Josiah came out to meet him in battle and was killed (2 Kings 23:29). The people of Judah then placed Jehoahaz on the throne (2 Kings 23:30), where he only reigned for three months (2 Kings 23:31), which, as shown above, crossed from 610t to 609t. As Neco/Necho returned southward, he took Jehoahaz captive and placed Jehoiakim on the throne (2 Kings 23:34).

With Jehoiakim’s reign established, Daniel’s captivity can be dated as having taken place when Nebuchadnezzar put down the rebellion Jehoiakim attempted in his 3rd year, $609t - 3 = 606t$ (2 Kings 24:1; Daniel 1:1–6).⁵⁰ This is further corroborated by Babylonian Chronicle V, which places the Battle of Carchemish and Nebuchadnezzar’s accession to the throne in the 1st half of 605n, overlapping the 2nd half of 606t. Jeremiah employs non-accession reckoning here, since he ties the Battle of Carchemish and Nebuchadnezzar’s accession year as a ‘first year’ to Jehoiakim’s 4th year (Jeremiah 25:1, 46:2). This still equates to 606t [$609t - (4 - 1) = 606t$], and because it was in the 2nd half of the Tishri year, Daniel’s captivity took place in 605 BC.

From the original chronological peg placing Jehoiachin’s and Ezekiel’s exile in 598t, Young also analyzed the events following, especially in regard to Jerusalem’s fall. A 586 BC date, suggested by Thiele, is incompatible with Ezekiel 33:21. The destruction of the city was reported in the 12th year of the exile, $598t - (12 - 1) = 587t$, on the 5th day of the 10th month, or 18 January 586 BC.⁵¹ Jerusalem, however, fell in the 4th month (2 Kings 25:3–4), during the previous summer. Going back six months from January, 586 BC places the destruction of Jerusalem in 587 BC.

Ezekiel 40:1 similarly sets the city’s demise in 587 BC, where the 25th year of the prophet’s exile, $598t - (25 - 1) = 574t$, is equated to the 14th year after the city’s fall, where $x - 14 = 574t$, solving for $x = 588t$. The city’s demise took place in the 4th and 5th months of the year (2 Kings 25:3–11), in the 2nd half of 588t, which overlaps the 1st half of 587n, again putting Jerusalem’s calamity in the summer of 587 BC. Since 574t is also a Jubilee year, the timing indicates that the city fell in a Sabbatical year, since the 14-year difference between 588t and 574t is divisible by seven. Interestingly, the Seder ‘Olam held a tradition that the First Temple in Jerusalem was destroyed in the latter half of a Sabbatical year,⁵² corroborating the biblical data (supplementary tables 4a and 4b).

Regnal year details for Zedekiah also support 587 BC as the year Jerusalem fell. The date of Jehoiachin’s exile, 598t, is also the date of Zedekiah’s accession (2 Kings 24:12, 17), and the tie to Nebuchadnezzar’s 8th year indicates non-accession reckoning. The siege of Jerusalem began in Zedekiah’s 9th year (2 Kings 25:1), parallel to Ezekiel’s claim that the siege began in the 9th year of his exile (Ezekiel 24:1–2), here showing non-accession reckoning for Zedekiah, or $598t - (9 - 1) = 590t$, with the 10th day of the 10th month falling on 26 January 589 BC.⁵³ Since both Zedekiah’s and Nebuchadnezzar’s regnal years were counted by non-accession reckoning, the end of the siege and of Zedekiah’s reign came in $598t - (11 - 1) = 588t$ by Judahite Tishri years, or 605n – $(19 - 1) = 587n$ by Babylonian Nisan years (2 Kings 25:2–9), again placing Jerusalem’s fall in 587 BC.

Classical sources that corroborate Assyrian records

Young continued to uncover additional support for Thiele’s chronology in its modified form, and reintroduced the work of Belgian priest and professor Valerius Coucke (KUKÉ).⁵⁴ Coucke’s conclusions, based on independent historical testimony from classical sources, supported Thiele’s modified chronology by providing two additional ways to confirm when temple construction began under Solomon, and thus a 1446 BC Exodus date (supplementary table 5a). Further, the Tyrian king list he used, examined by more recent scholars like F.M. Cross,⁵⁵ provided independent

corroboration for dates of the reigns of Ahab and Jehu early in the Divided Kingdom, in a sense coming full circle to the first chronological pegs identified by Thiele (supplementary table 5b).

The chronologies of Pierce and Austin

Christians certainly can disagree, and that is the case with two authors, Larry Pierce and David Austin, who have published alternative chronologies in *Journal of Creation*. Pierce, who translated Ussher's work, criticized Thiele and McFall in a 2001 article.⁵⁶ The article also supplied a 53-page download outlining the reasoning behind the chronology Pierce supports.⁵⁷ Austin has written four articles from 2007–2019 that are relevant to this discussion,⁵⁸ with a markedly different chronology. Both men clearly distrust extra-biblical historical sources; Pierce sets his single secular chronological anchor in 562 BC, following Ussher and Ptolemy's Canon,⁵⁹ and Austin sets his in 331 BC, working backward from Alexander the Great to derive dates, with no other ties to external historical records.⁶⁰

Pierce imposed two Talmudic interpretational rules for regnal years on the Bible: 1) they were always counted from the start of a coregency, and 2) they were always reckoned

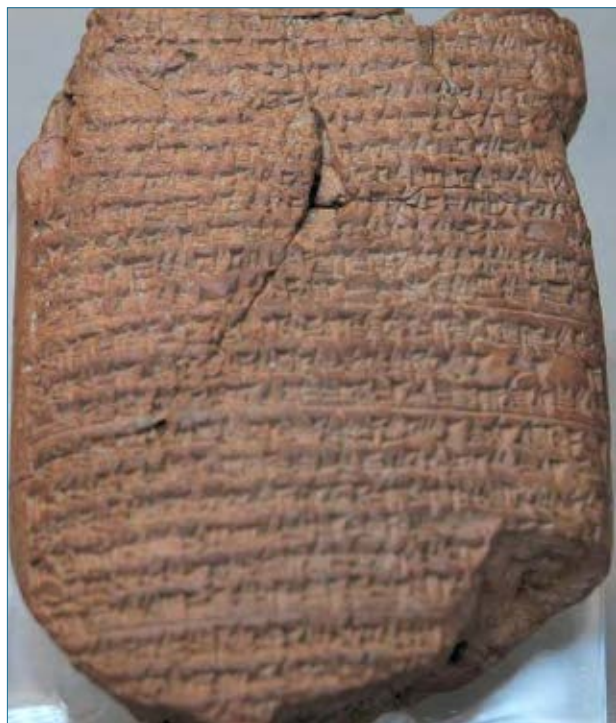


Figure 4. Babylonian Chronicle V. This small clay tablet (8 x 6 cm or 3.15 x 2.36 in) records Nebuchadnezzar II's capture of a king of Judah on 16 March 597 BC. It is also called the Jerusalem Chronicle or the Chronicle Concerning the Early Years of Nebuchadnezzar II and is listed as British Museum number 21946.

by Nisan years.⁶¹ He did not mention the coregency rule until the conclusion of his article, after using it to falsely accuse Thiele and McFall of calling the biblical text incorrect and changing Jeroboam II's synchronism with Azariah/Uzziah.⁶² Pierce twisted their calculations to his own definition; since Azariah/Uzziah started his coregency in 791t and Jeroboam II started his coregency in 793n, then, according to Pierce's application of the Talmudic rule, Azariah/Uzziah began his reign in the 3rd year of Jeroboam II. But Thiele and McFall had tied the start of Azariah/Uzziah's sole reign to the 27th year of Jeroboam II from his coregency (supplementary tables 2a and 2b), honoring the biblical text.

Pierce refused to accept a coregency between Azariah/Uzziah and his father (supplementary table 3), pointing to the sequence in which biblical details for their reigns appeared. In contrast, McFall noted that "similar subject matter has taken precedence over chronology" in this timeframe.⁶³ A synchronism for Azariah/Uzziah appears in discussion of his father's reign (2 Kings 14:21–22) and another follows the discussion of Jeroboam II's reign (2 Kings 15:1–2). Notably, the two synchronisms that tie to the start of Azariah's/Uzziah's coregency (2 Kings 14:21–22, 2 Chronicles 26:1–3) state that the people of Judah made him king "instead of" his father, an event likely prompted by his father's capture (2 Kings 14:13, 2 Chronicles 25:23). Also, Tiglath-Pileser III mentions Azariah of Judah in his records, but Pierce's chronology places Azariah/Uzziah well before him.

Further, Pierce misstates history, citing Ptolemy's Canon and claiming that Babylonian king Merodach-Baladan died in 710 BC.⁶⁴ Thiele, in contrast, knew the limitations of Ptolemy's Canon, explaining: "[It] was prepared primarily for astronomical, not historical, purposes. It did not pretend to give a complete list of all the rulers of either Babylon or Persia."⁶⁵ Babylonian Chronicle I says that Merodach-Baladan, called Marduk-apla-iddina, was driven out of Babylon by Assyrian king Sargon in 710n. Sargon's son, Sennacherib, went to Babylon in 703n to drive Merodach-Baladan out a second time, but did not succeed in killing him.⁶⁶ Pierce also cited two interregna in Babylon during this time,⁶⁷ but they are not true interregna: in 704–703n, Babylon revolted against Assyrian kingship, and in 689–681n, Sennacherib destroyed the city and left it in ruins for the remaining eight years of his reign. These were not interregna so much as Babylon trying to throw off foreign rule and refusing to recognize a foreign king.

Pierce also incorrectly used prophecy as if it provided chronological data, imposing a 390-day sign against Israel (Ezekiel 4:4–6) as a chronological statement that the Divided Kingdom lasted 390 years.⁶⁸ James Bejon, from Tyndale House Library, astutely observed:

"[This] does not strike me as a very wise course of action. Why? Because it makes our chronology dependent on a particular interpretation of Ezekiel's prophecy. If chronology devoid of checks and balances has confused its thousands, then prophecy devoid of checks and balances has

confused its tens of thousands The purpose of prophecy is not to derive chronologies; it is to show us how God is at work in the world and how *he* views world history.”⁶⁹

In comparison, Austin commits both errors cited by Bejon; he works backward from 331 BC without any historical cross-checks, and his calculations are largely based on his interpretation of prophecy (supplementary figure 5). Austin started with an assumed date for the baptism of Jesus, AD 26,⁷⁰ as the endpoint of a prophecy he interpreted as covering 483 years (Daniel 9:25),⁷¹ then worked backward to date the Persian conquest of Babylon (Daniel 9:1). Austin rightfully used 331 BC as the date the Greek Empire began, but his overlay with the 483-year span meant that the length of the Persian Empire came up 82 years short, a mere 126 years in Austin’s chronology rather than the 208 years recorded in history.⁷² Then, from his date for the beginning of the Persian Empire, Austin went back 70 years for the Jewish captivity to date Daniel’s captivity⁷³ and the 4th non-accession year of Jehoiakim. From this date for Jehoiakim, he derived the year his son succeeded him and was taken captive, in order to find the 5th year of Ezekiel’s and Jehoiachin’s exile (Ezekiel 1:1–2). Austin made this the end point of a prophetic sign of 390 years (Ezekiel 4:4–5) and went backward to date the beginning of the Divided Kingdom. That date provided the end of Solomon’s reign and was used to determine his 4th year. Then Austin added to Scripture’s clearly stated figure of precisely 480 years between the temple and the Exodus (1 Kings 6:1) by taking a variant figure from Josephus⁷⁴ to justify an extra 114 years of oppression and usurpation from the book of Judges.

Perhaps to legitimize his shortened period for the Persian Empire, Austin speculated that Darius I was the same king as Artaxerxes I,⁷⁵ all of which creates three insurmountable problems in his chronology (supplementary figure 5 ‘Questions’). In the 7th year of Darius, the first group of Jewish exiles to return to Jerusalem celebrated Passover, and in the 7th year of Artaxerxes, Ezra and a second group of exiles came to Jerusalem. Austin suggests these events happened under the same king in the same year, and that the longer chronology in Ptolemy’s Canon is unreliable. Austin tries to support this by citing two genealogies which he claims show Ezra was born about the time of Jerusalem’s fall, making him too old to have been in the service of a later Persian king. But the genealogy that names Ezra is clearly abbreviated, allowing him to be a grandson or great-grandson of the person Austin claims was Ezra’s father (1 Chronicles 6:1–15; Ezra 7:1–6).⁷⁶ Austin also misstated history because he, like Pierce, ignored sources used by Thiele. Austin assigned a 12-year reign to Xerxes, citing Ussher, but archeological inscriptions indicate 21 years, in agreement with Ptolemy’s Canon.⁷⁷ The collection of inscriptions go further, however, corroborating Ptolemy’s Canon for the entire Persian period, and eliminating the possibility that Artaxerxes is the same king as Darius.

As to the interpretation of Ezra 6:14, where three Persian kings are listed, historical information sometimes appears in topical rather than sequential order. Ezra was focusing on the Second Temple and the manner in which God directed the actions of foreign kings in regard to it. Artaxerxes’ decree was not for building it, but for beautifying and supplying it, and allowing Ezra to go to Jerusalem to serve there (Ezra 7:27–28).

The impact of chronological interpretations on the Gospel

The most distressing error in these alternative chronologies is Pierce’s conflation of biblical authority with his own (or Ussher’s) interpretation of biblical data, which results in a false dilemma between the Bible and secular archaeology. Half a century earlier, Thiele observed that: “Basically there is, of course, only one chronology; that is correct chronology. Between the absolute chronology of the Hebrews and that of their neighbors there can be no conflict.”⁷⁸ Any records that reflect true history will be in agreement, even those that come from outside the Bible. It would be very difficult to argue that a particular interpretation of biblical chronology is correct if it continues to disagree with solid evidence from surrounding nations, and yet this is what Pierce endeavours to do.

In contrast to Thiele, Pierce claims, in solid genetic fallacy style: “Very few archaeologists are Christians and most would reject the historicity and authority of the Word of God. Therefore, expect anything they find to be interpreted in a way that is unhelpful to Bible-believing Christians.”⁷⁹ This is a distraction from the real issue, however. Pierce is equating Ussher’s chronology with the Bible itself. He says: “Ussher’s results, based on the Bible alone, violate just about every ‘absolute date’ in archaeology. Amen. All this shows is that we may not know as much about history as God does.”⁸⁰ In reality, Ussher used secular sources as well as Scripture, and he had imperfect knowledge. His chronology should in no way be construed as inerrant truth like God’s Word, and it is fair to point out areas where Ussher’s work needed correction.

Young and fellow chronologist Andrew Steinmann point out a simple yet profound principle, that “when a witness has been found truthful in all statements that can be verified by an independent source, that witness should be assumed to be credible when speaking of events that cannot be independently verified.”⁸¹ Conversely, if a witness is contradicted by other sources, that witness will be considered unreliable in regard to additional claims. McFall also understood this, explaining:

“The existence of these so-called glaring errors will dictate and shape one’s doctrine of the inspiration and infallibility of God’s Word. Where it is possible to remove the suspicion of carelessness in the transmission of God’s Word, this will embolden others to investigate other claims of carelessness in God’s Word in the hope that these, too,

can receive a satisfactory solution and increase faith in the trustworthiness of the Word of God.”⁸²

What happens when a student, for example, hears that the Bible’s account of history is contrary to well-established secular sources taught in the classroom? If he or she deems Scripture untrustworthy on the past, a mere collection of ancient myths and religious traditions, why investigate the Bible’s claims about the future and take seriously the Bible’s warnings and promises about the two potential destinations awaiting people after they die? The stakes are too high to allow anyone to be misguided about God’s Word. Our Saviour “desires all people to be saved and to come to the knowledge of the truth (1 Timothy 2:4, ESV)”.

Conclusion

With history and chronology, reliable sources will corroborate one another because they reflect real events from the past. It should come as no surprise that the Bible corresponds to other historical records because its Author has witnessed all of history and reveals it to demonstrate that He is God and there is none like Him (Isaiah 41:21–23, 43:9–11, 46:9–10). When people understand that the Bible is accurate about the past, they have reason to believe it will also be right about the future, and it is worthwhile to consider what it says. Our Saviour and Lord wants everyone to repent rather than perish (2 Peter 3:9), but how likely are they to repent if they “do not hear Moses and the Prophets” (Luke 16:30–31, ESV)? For those who will hear, however, the “sacred writings ... are able to make you wise for salvation through faith in Christ Jesus” (2 Timothy 3:15, ESV).

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2. Following a United Monarchy period under Saul, David, and Solomon, national Israel split in two with the Southern Kingdom of Judah under Solomon’s son, Rehoboam, and the Northern Kingdom of Israel under Jeroboam I.
3. Thiele, E., The chronology of the kings of Judah and Israel, *J. Near Eastern Studies* (JNES) 3(3):137–186, July 1944, jstor.org/stable/542915?seq=1.
4. Thiele, E., *The Mysterious Numbers of the Hebrew Kings*, 1st edn, Macmillan, New York, 1951; 2nd edn, Eerdmans, Grand Rapids, MI, 1965; 3rd edn, Zondervan/Kregel, Grand Rapids, MI, 1983.
5. These years were lunisolar; months ran in cycle with the moon, but occasionally an intercalary month was added in order to keep the seasons in line with their associated months. This meant that Nisan 1 could land anywhere from mid-March to mid-April, and Tishri 1 from mid-September to mid-October. Nisan was called Abib prior to the Exile (Exodus 13:4, 23:15, 34:18; Deuteronomy 16:1) and Nisan after (Nehemiah 2:1; Esther 3:7). Tishri is not listed in the Old Testament, but its older name, Ethanim, is associated with the 7th month (1 Kings 8:2). In the Bible, months are always numbered from Nisan as the 1st month (Exodus 12:2, Esther 3:7), whether using Tishri or Nisan years.
6. James Bejon, a researcher at Tyndale House Library in Cambridge, explains this in perhaps a more understandable way than Thiele by updating it for modern terminology. In 1 Kings 6:37–38, Solomon began the temple in the 2nd month of his 4th year and finished it in the 8th month of his 11th year, and the project took seven years. If Solomon came to the throne in AD 2000, for example, and if Nisan (the 1st month) is equated with April, and Tishri (the 7th month) is equated with October, then there are two possible scenarios. With Nisan years, Solomon’s 4th year would have begun April 2004, and the temple would have been started in May 2004 and finished in November 2011. Counting inclusively, this stretches over eight calendar years. But with Tishri years, his 4th year would have begun on October 2004, but he would not have started the temple until May 2005, and he would have finished in November 2011. In this scenario, the project only stretches over seven calendar years. Bejon, J., Biblical Chronology: patterns and coherence (unpublished), tyndalehouse.academia.edu/JamesBejon; Thiele, ref. 3, pp. 141–143; Thiele, ref. 4, 1st edn, pp. 29–33.
7. If Josiah’s 18th year had started on Nisan 1, he would have only had until the evening of Nisan 14 to accomplish all of the activities listed in 2 Kings 22:3–23:23 that preceded the Passover. Thiele, ref. 3, pp. 142–143; Thiele, ref. 4, 1st edn, p. 32.
8. Talmud, b. Rosh HaShana/Hashanah 2a, chapter I, paragraph 1, [halakhah.com or sefaria.org/texts/Talmud](http://halakhah.com/sefaria.org/texts/Talmud).
9. Luckenbill, D.D., *Ancient Records of Assyria and Babylonia* (ARAB), vol. I, The University of Chicago Press, Chicago, IL, 1926, oi.uchicago.edu/research/publications/misc/ancient-records-assyria-and-babylonia-volume-1-historical-records-assyria, vol. II, 1927, oi.uchicago.edu/research/publications/misc/ancient-records-assyria-and-babylonia-volume-2-historical-records-assyria.
10. Assyrian Eponym Canon (Limmu List): Eponym lists and chronicles, University College London, ucl.ac.uk/sargon/eponymlistsandchronicles/; Limmu List (858–699 BCE), livius.org/articles/concept/limmu/limmu-list-858-699-bce/; Rawlinson, H., Assyrian history, *The Athenaeum*, No. 1805, 31 May 1862, pp. 724–725, catalog.hathitrust.org/Record/009663854; Rawlinson, H., Bible history and the Rawlinson Canon, *The Athenaeum*, No. 1812, 19 July 1862, pp. 82–85, catalog.hathitrust.org/Record/009663854; Rawlinson, H., The Assyrian Canon verified by the record of a solar eclipse, B.C. 763, *The Athenaeum*, No. 2064, May 18, 1867, pp. 660–661, catalog.hathitrust.org/Record/009663854; Smith, G., *The Assyrian Eponym Canon*, London, Samuel Bagster and Sons, 1875, pp. 27–28, catalog.hathitrust.org/Record/001596760, chap. v, pp. 101–105).
11. Kurkh Stela (Monolith Inscription) of Shalmaneser III (859n accession, 858–824n), BM 118884, Luckenbill, ARAB, vol. I, ref. 9, §594, 610–611, research.britishmuseum.org/research/collection_online/collection_object_details.aspx?object=20160&objectId=367117&page=1&partId=1&people=92929.
12. Black Obelisk of Shalmaneser III (859n accession, 858–824n), BM 118885, Luckenbill, ARAB, vol. I, ref. 9, §553–554, 590, 671–672, research.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=367012&partId=1.
13. Regnal years from table 1 come from Young, R., Tables of reign lengths from the Hebrew court recorders, *J. Evangelical Theological Society* (JETS) 48(2):225–248, June 2005, rcyoung.org/papers.html; McFall, L., A translation guide to the chronological data in Kings and Chronicles, *Bibliotheca Sacra* 148:3–45, 1991; lmf12.wordpress.com/published-articles/; Thiele, ref. 4, all editions, Appendices A and B. Young’s dates are considered the correct ones where differences exist among the three chronologists, with two exceptions where McFall’s dates are accepted instead. (1) Ahaziah (Judah): Two points lean in favour of a coregency of Ahaziah with his father, Jehoram/Joram. First, there are two synchronisms for the start of his reign, one in the 11th year of Jehoram/Joram of Israel (2 Kings 9:29), which would designate the start of Ahaziah’s coregency, and one in the 12th year of Jehoram/Joram of Israel (2 Kings 8:25), which would designate the start of Ahaziah’s sole reign. Second, Ahaziah’s father had a debilitating disease which lasted the final two years of his life (2 Chronicles 21:19), a time period that would match a two-year coregency between father and son from 843t to 842t. McFall, Translation guide (above), pp. 19–20, §26. (2) Joash/Jehoash (Israel): A small mathematical inconsistency appears in Young’s table 3, in which he synchronized Jehoahaz of Israel to Joash of Judah by non-accession reckoning, but then synchronized Jehoash of Israel to Joash of Judah by accession reckoning. Joash of Judah used non-accession reckoning, so all synchronisms to his reign require non-accession calculation. Correcting the start of the reign of Joash/Jehoash (Israel) to the 37th non-accession year of Joash/Jehoash (Judah) is 836t – (37 – 1) = 800t, with 800t/799n1 as the overlap. This makes 799n the start of a coregency of Joash/Jehoash (Israel) with his father, Jehoahaz/Joahaz, in agreement with Leslie McFall’s calculation. McFall, Translation guide (above), p. 23, §35.

Archaeological source in table 1 not cited elsewhere: Records for Nebuchadnezzar II’s son, Evil-Merodach/Amel-Marduk, confirm the date of Jehoiachin’s captivity. According to 2 Kings 25:27 and Jeremiah 52:31, Jehoiachin was released in his 37th year of exile, in the 12th month (or 2nd half) of Evil-Merodach’s/Amel-Marduk’s accession year. Inscriptions noted in Parker and Dubberstein, ref. 48, p. 26 indicate the accession year was 562n, and 562n + (37 – 1) = 598n gives the ‘year one’ of Jehoiachin’s exile, confirming the date from Babylonian Chronicle V and biblical synchronisms. Further, Jehoiachin’s Rations Tablet identifies a king of Judah by what appears to be the Babylonian version of his name (Weidner Ration List (Jehoiachin’s Rations Tablet), jerusalem.nottingham.ac.uk/items/show/127).

14. Thiele, ref. 4, 1st edn, p. 114.

15. Cook also went to great lengths to explain how Pekah's identification as an officer in Pekahiah's court (2 Kings 15:25) did not preclude Pekah from acting as an independent king within Israel, a person who did not necessarily live in Samaria in his likely role as some sort of military commander for Pekahiah. Cook, H.J., Pekah, *Vetus Testamentum* 14(2):121–135, April 1964; [jstor.org/stable/1516376?seq=1](https://www.jstor.org/stable/1516376?seq=1).
16. Thiele, ref. 4, 3rd edn, p. 61. See also Young, R., When was Samaria captured? JETS 47(4):581–582, December 2004, footnote 11, rcyoung.org/papers.html; Young, R., Ussher explained and corrected, *Bible and Spade* 31(2):45–56, 2018, p. 55, rcyoung.org/papers.html.
17. Luckenbill, ARAB, vol. I, ref. 9, §770.
18. The Bible identifies Tiglath-Pileser III (745n accession, 744–727n) as Pul through the use of an epexegetical *waw* or *vav* (an explanatory Hebrew grammatical construction translated “that is”) in 1 Chronicles 5:26, so it reads “the spirit of Pul, king of Assyria, that is, the spirit of Tiglath-Pileser, king of Assyria...”. This identification is followed by a singular Hebrew verb, indicating one person took or carried the people into exile. Thiele, ref. 3, p. 155, footnote 34; Thiele, ref. 4, 1st edn, pp. 75–77.
19. Thiele, ref. 3, pp. 155–156; Thiele, ref. 4, 1st edn, pp. 75–77. Further evidence that Tiglath-Pileser and Pul were the same person appeared in 1993 with the discovery of the Incirli Stela, which calls Tiglath-Pileser III by both names, with Pul translated ‘Puwal’ or ‘Pual’. Kaufman, S., The Phoenician inscription of the Incirli Trilingual: a tentative reconstruction and translation, *MAARAV: A J. Study of the Northwest Semitic Languages and Literatures* 14(2):7–26, 2007, photos pp. 107–120 [sic], academia.edu/41060049/THE_PHOENICIAN_INSCRIPTION_OF_THE_INCIRLI_TRILINGUAL_A_TENTATIVE_RECONSTRUCTION_AND_TRANSLATION.
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21. The Canon appears in Ptolemy's *Handy Tables*. Depuydt, L., More valuable than all gold: Ptolemy's Royal Canon and Babylonian chronology, *J. Cuneiform Studies* 47:97–117, 1995, caeno.org/index.php/authors-text-2; Lendering, J., Ptolemy's Canon, livius.org/articles/concept/ptolemys-canon/.
22. Luckenbill, ARAB, vol. I, ref. 9, §761, 772. At the time that Thiele first presented his chronology for the Divided Kingdom period, many Assyriologists had assigned a date of 738 bc to the tribute given by Menahem to Tiglath-Pileser III, based on a reconstruction of fragmented records that placed the tribute sometime between the king's 3rd and 9th years (743 and 737 bc, respectively, with non-accession reckoning). Thiele presented an extensive analysis of the chronological and geographical clues found not only in the Eponym List and Annals, but also in Nimrud Tablet no. 1, Nimrud Slab no. 1, and Nimrud Slab no. 2. He found that the tribute of Menahem was more likely in Tiglath-Pileser's 3rd year, 743 bc, fitting within the regnal years for Menahem. Thiele, ref. 3, pp. 156–163; Thiele, ref. 4, 1st edn, pp. 78–98. This conclusion was later supported by the discovery of the Iran Stela, published in 1994, which indicated tribute lists were summaries of events that could be assigned to dates earlier in the king's reign. Young, R., Evidence for inerrancy from an unexpected source: OT chronology, *Bible and Spade* 21(2):54–64, 2008, pp. 60, 62, 64, rcyoung.org/papers.html; photo, imj.org.il/en/collections/198926.
23. Luckenbill, ARAB, vol. I, ref. 9, §816.
24. Olmstead, A., The Fall of Samaria, *American J. Semitic Languages and Literatures* 21:179–182, 1904–1905.
25. Although Shalmaneser's brother and successor, Sargon II, claimed Samaria's defeat occurred under his rule, Olmstead, ref. 24, made a strong case that this appeared to be a boast added to his records later in his reign (Thiele, ref. 3, p. 173, ref. 4, pp. 121–125).
26. Thiele, ref. 3, p. 144.
27. McFall, L., Translation guide, ref. 13.
28. Horn, S., The chronology of King Hezekiah's reign, *Andrews University Seminary Studies* (AUSS) 2(1):40–52, 1964; digitalcommons.andrews.edu/auus/vol2/iss1/4.
29. Parker, E., A note on the chronology of 2 Kings 17:1, AUSS 6(2):129–133, 1968; digitalcommons.andrews.edu/auus/vol6/iss2/1/. McFall understood Hebrew verb forms very well because his doctoral dissertation covered this topic. McFall, L., The Hebrew Verbal System (1978 Cambridge University Ph.D. thesis), published by Almond Press, Sheffield, 1982; lmf12.wordpress.com/research-work/.
30. That Hebrew verbs are less specific than English verbs is also observed in Genesis 2:19, where the verb is translated that God “had formed” the animals, indicating the sequence of creation in Genesis 1 is still in agreement with that in Genesis 2.
31. Young, Samaria, ref. 16. These numbers can be tricky, and great respect is due to those who reconciled them. Jotham ruled 20 years, but this includes a 12-year coregency with his father, and coregencies are treated as non-accession reckoning. This is why from the start of Jotham's reign in 751t to its end in 732t there is a span of only 19 years (20 – 1 = 19). Ahaz's reign comes with a twist: although he had a five-year coregency with his father, from 736–732t, there was political factionalism at this time. Ahaz had a policy of Assyrian appeasement, apparently unlike his father, and some considered Jotham to be officially retired or deposed when Ahaz started to reign. So those supporting Ahaz's policy considered him a sole ruler beginning in 736t, and, counting his reign by accession reckoning, they synchronized his 12th year (736t – 12 = 724t) to the 9th year of Hoshea (2 Kings 17:1, where the verb is properly translated that Hoshea “had reigned”). With Hezekiah, calculations return to normal. The 6th year of his coregency with his father, Ahaz, is treated as non-accession reckoning, where 729t – (6 + 1) = 724t.
32. Young, R., When did Solomon die? JETS 46(4):589–603, December 2003; rcyoung.org/papers.html.
33. This calculation works in the same way as non-accession reckoning because the formula needs to find ‘year one’, not ‘year zero’.
34. Cassuto, U., *The Documentary Hypothesis and the Composition of the Pentateuch*, translated from the Hebrew by Israel Abrahams, Shalem Press, Jerusalem and New York, Lecture 4, pp. 61–63, 2006.
35. Wood, B., The rise and fall of the 13th century Exodus–Conquest theory, JETS 48(3):475–489, September 2005; biblearchaeology.org/research/chronological-categories/conquest-of-canaan/2579-the-rise-and-fall-of-the-13th-century-exodusconquest-theory.
36. Young, Solomon, ref. 32, p. 600, footnote 12, crediting an internet forum suggestion from ‘David Rice of San Diego’.
37. Talmud, ref. 8, b. Megilah/Megillah 14b. The mention of the prophetess Huldah in 2 Kings 22:14 falls between the synchronisms to Josiah's 18th year in 2 Kings 22:3 and 23:23.
38. Talmud, ref. 8, b. Arakin/Arachin/Arakhin 12a to identify a Jubilee year, b. Arak. 12b to identify the 17th cycle.
39. Young, R., The Talmud's two Jubilees and their relevance to the date of the Exodus, *Westminster Theological J.* 68:71–83, 2006; rcyoung.org/papers.html. Besides the 49-year span between the two Jubilees mentioned in the Talmud, Young points out that other Jewish literature affirms a 49-year Jubilee cycle, such as the 2nd century BC Book of Jubilees and the c. 1st century AD Qumran text 11QMelchizedek. He also notes the 49-year observation practised by Samaritans.
40. According to the Talmud, Sabbatical years started in Tishri (b. Rosh Hash. 1a, per Young, Talmud's two Jubilees, ref. 39, p. 75, but b. Rosh HaShana/Hashanah 2a per the Talmud, ref. 8). See also Steinmann, A., *From Abraham to Paul: A biblical chronology*, Concordia Publishing House, St. Louis, MO, pp. 25–36, 2011. The agricultural timing fits with this understanding since sowing took place in the fall months and harvesting during the spring months. Jubilee years clearly began in the 7th month according to Leviticus 25:8–9.
41. This calculation operates under the same rationale as ref. 33.
42. Young, R., Three verifications of Thiele's date for the beginning of the Divided Kingdom, AUSS 45(2):163–189, 2007, rcyoung.org/papers.html, Second Verification: The Jubilee and Sabbatical Cycles, pp. 173–179. Young, R., Seder ‘Olam and the Sabbaticals associated with the two destructions of Jerusalem, parts I–II, *Jewish Bible Quarterly* 34(3):173–179, 34(4):252–258, 2006, rcyoung.org/papers.html, ‘part II’, p. 254, for 4th year of Jeremiah 28:1, p. 257, for Hezekiah and one and two invasion theories. Young, R., When did Jerusalem fall? JETS 47(1):21–38, March 2004, rcyoung.org/papers.html, p. 28, for 30th year of Ezekiel 1:1–2.
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44. Talmud, ref. 8, b. Arakin/Arachin/Arakhin 32b.
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46. Decision tables examine all possible combinations of factors and their results. In Young's application to chronology, he considers all assumptions, such as whether Nisan or Tishri years were used, or accession or non-accession reckoning was employed.
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50. Daniel uses accession reckoning since the prophet claimed three years of training in Babylon (Daniel 1:5) before he appeared before Nebuchadnezzar in the 2nd year of his reign (Daniel 2:1). Steinmann, A., *Daniel*, Concordia Publishing House, St. Louis, MO, 2008, pp. 111–112.
51. Parker and Dubberstein, ref. 48, p. 26.
52. Young, Seder 'Olam, part I, ref. 42; Guggenheimer, ref. 43, p. 264. Young deals with another translator who places the temple's destruction after a Sabbatical year, and explains why Guggenheimer's translation, placing the event in the latter half of a Sabbatical year, is correct.
53. Parker and Dubberstein, ref. 48, p. 26.
54. Young, R., The Parian marble and other surprises from chronologist V. Coucke, AUSS 48(2):225–249, 2010, rcyoung.org/papers.html; Young, R. and Steinmann, A., Correlation of select classical sources related to the Trojan War with Assyrian and biblical chronologies, *Journal for the Evangelical Study of the Old Testament* (JESOT) 1(2):223–248, 2012, rcyoung.org/papers.html; Young, R., Solomon and the kings of Tyre, *Bible and Spade* 30(3):66–73, 2017, rcyoung.org/papers.html; Young, R., Translation of Coucke's 1928 article on OT chronology (unpublished), rcyoung.org/papers.html.
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59. Pierce, footnote, ref. 57, p. 2.
60. Austin, Four Periods, ref. 58, pp. 57, 59, and footnote 10.
61. Rule 1 appears in Pierce, Evidentialism, ref. 56, p. 67 (under "Conclusion"), and Pierce, footnote, ref. 57, p. 2 (under "Viceroy"), and p. 3 (under "Assumptions"). Although Pierce claims that this rule comes from the Talmud and the Mishnah, he provides no verifiable citation for this claim. Rule 2 appears in Pierce, footnote, ref. 57, p. 2 (under "Assumptions"). Pierce claims this rule comes from the Talmud and Mishnah as well, and although he does not provide a verifiable citation, the Talmud does claim that kings started their regnal years in Nisan (Talmud, ref. 8, b. Rosh HaShana/Hashanah 2a).
62. Pierce, Evidentialism, ref. 56, p. 65, "According to Thiele, McFall and others the text is incorrect. They say that it should read in the 3rd year of Jeroboam not the 27th."
63. McFall, Translation Guide, ref. 13, pp. 24–25.
64. Pierce, Evidentialism, ref. 56, p. 66.
65. Thiele, ref. 4, 1st edn, Appendix G, p. 293.
66. Babylonian Chronicle I, ref. 20, column II, lines 1–20. Levine, L., Sennacherib's Southern Front: 704–689 B.C., *J. Cuneiform Studies* 34(1/2):28–58, Jan–Apr, 1982, jstor.org/stable/1359991?seq=1, pp. 31–33; Brinkman, J., Merodach-Baladan II, *Studies Presented to A. Leo Oppenheim*, 7 June 1964, The Oriental Institute of the University of Chicago, pp. 6–53, oi.uchicago.edu/research/publications/misc/studies-presented-leo-oppenheim-june-7-1964, p. 45. Levine and Brinkman offer corroboration from BM 113203 (britishmuseum.org/collection/object/W_1915-0410-1).
67. Pierce, footnote, ref. 57, p. 23; Pierce's reply to McFall, *Chronologies*, *J. Creation* 16(2):63–68, 2002, pp. 64–65.
68. Pierce, footnote, ref. 57, pp. 12, 21.
69. Bejon, J., Ezekiel's 390 and 40 Days (unpublished), p. 26, tyndalehouse.academia.edu/JamesBejon/Misc-Papers.
70. Ussher, ref. 1, makes AD 26 the start of Jesus' ministry (§6280), and AD 27 the year of his baptism (§6288).
71. Austin interprets seven weeks (or 'sevens') plus 62 weeks as 69 seven-year periods or 69 x 7 = 483 years. There are many, many proposed interpretations for this prophecy, with different start and end dates and different suggestions of what is intended by the reference to weeks.
72. After the Babylonian empire, the Persian empire ran for 208 years from 539–331 bc. Austin sets the length of the Persian empire by what is left of 483 years after adding 26 years on the AD side to 331 years on the BC side, leaving only 126 years for the Persian Empire.
73. Jeremiah 25:1, 11–12 is dated at Daniel's captivity, and Jeremiah 29:1–2, 10 at Jehoiachin's and Ezekiel's captivity. Steinmann, *Daniel*, ref. 50, p. 435, takes 70 years as a round number.
74. Austin, Three periods, ref. 58, 594 (480 + 114) years, pp. 51–52, 592 years, p. 57. Flavius Josephus, *The Antiquities of the Jews*, translated by William Whiston, EBook #2848, Book VIII, chap. 3, §1, [gutenberg.org/files/2848/2848-h/2848-h.htm](https://www.gutenberg.org/files/2848/2848-h/2848-h.htm) for 592 years; Josephus, *Against Apion*, ref. 55, Book II, §2 for 612 years.
75. Austin, Darius, ref. 58.
76. A comparison of 1 Chronicles 6:1–15 to Ezra 7:1–6 shows the latter is an abbreviated list. Austin claims both Ezra and Jehozadak were sons of Seraiah, but Austin's reference to 2 Kings 25:18–21 only indicates Seraiah was killed when Jerusalem fell, and sheds no further light on the genealogical line. It is entirely possible that Ezra was Seraiah's grandson, born to Jehozadak some years into the exile, or even that Ezra was Seraiah's great-grandson and Jehozadak's grandson. Ezra did not go to Jerusalem with the first wave of exiles following Cyrus's decree in 538 bc, but rather with the second wave under Artaxerxes I's decree in 458 bc (Ezra 7:7–9). The MacArthur Study Bible (MacArthur, J. (Ed.), English Standard Version, Crossway, Wheaton, IL, 2010), in the introduction to the book of Ezra, points out that Ezra does not mention himself nor use first person pronouns until chapter seven.
77. Austin, Darius, ref. 58, p. 47. Ussher, *Annals*, ref. 1, §1176. Parker and Dubberstein, ref. 48, pp. 11–17.
78. Thiele, ref. 4, 1st edn, p. 2.
79. Pierce, Evidentialism, ref. 56, p. 63.
80. Pierce, footnote, ref. 57, p. 24. Another example of conflation comes from p. 38: "Dr. Thiele firmly declares that Samaria fell in 723 bc and adjusts the biblical chronology two years to shift the biblically deduced date of 721 bc to 723. (If the integrity of the scriptures was not at stake this is no big deal!)."
 81. Young and Steinmann, Correlation, ref. 54, p. 247.
 82. McFall, L., The chronology of Saul and David, *JETS* 53(3):475–533, 2010, p. 505, lmf12.wordpress.com/published-articles/.

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Evolution of the human skin

Jerry Bergman

This review looks briefly at the evolution of human skin. Our skin is unique, employing a very different design and construction compared to that of all other mammals, including our closest primate 'relatives'. The differences between human skin and that of any other creature, primate or otherwise, are so large that no viable 'just-so' story has yet been proposed to account for this.

The origin of body coverings, specifically scales, feathers, skin, and hair, has stymied evolutionists since Darwin. Most mammals, birds, and reptiles are readily recognized by their hairs, feathers, and scales, respectively. However, the lack of fossil intermediate forms between scales and hairs and substantial differences in their morphogenesis and protein composition have fuelled the controversy pertaining to their potential common ancestry for decades.¹

Skin, one of the most visible parts of the human body, covers us from head to toe. It is our largest organ and, in many ways, a very unique one. It is also considerably complex, as skin diagrams effectively illustrate (see figures 1 and 2). Skin in general (not just that of humans) has many functions, including sensing of danger, protection from pathogens, regulation of internal temperature, maintaining fluid balance, regulating pH, and presenting visual sexual displays.²

For humans and the higher primates, it has a further important function, namely that of bonding between individuals. Research has documented that, without being touched and cuddled by their mothers, both human and chimp babies become very apathetic and fail to progress emotionally.³

According to Gallo's observation, "human skin has many functions that are in common with other animals but also is unique to our species."² This causes a problem for research on the development of skin-related pharmaceuticals. Animals can provide useful models in the first stages of such drug development, but human and animal skin are so different that the results have often been hard to translate to humans, leading to many clinical trial failures. Since cultured human skin tissue, also used on burns victims, has become available, it can be used to perform safety and efficacy studies of cosmetics, drugs, and medical devices, so animal skin models are no longer used to anywhere near the same extent to generate valuable data. Real human skin models will always yield better and more reliable results that are easy to translate into clinical trials.⁴

Human skin evolution?

Evolutionists concede that "Since human skin is very different from that of all other known mammals, its evolution

has very likely been unique." But aside from speculative 'just-so' stories, no evidence exists for this skin evolution.⁵ The evolutionary origin of the hair on skin is also unknown.⁶

The principal point of "The uniqueness of human skin is that it has lost its hair cover but has remained, nonetheless, hairy; the only hair it has lost are the vibrissae" (the long hairs used on the body of virtually all mammals for sensory input). The hairs over most of the human body surface are very fine and exist at a density so low that human skin *appears* to be naked.^{7,5}

The claim that humans evolved from a fur-covered ape-like ancestor and then lost their thick hair presents an evolutionary problem.⁸ Those accepting this belief do so without empirical evidence. Jablonski writes:

"Explanations for the evolution of human hairlessness have been many, varied, and often highly creative. The most cogent explanations are based on the importance of a functionally naked skin in maintaining body temperature in hot environments."⁹

A related theory of why humans supposedly lost their fur hair was proposed by Wheeler, who argued that

"... the lower direct solar radiation fluxes incident upon a bipedal mammal made possible the reduction of body hair, and explains the absence of this characteristic among savannah quadrupeds. The major thermoregulatory advantages conferred by bipedality, to an animal extremely sensitive to hyperthermia, could also account for the initial evolution of this unusual form of locomotion."¹⁰

Another somewhat different theory of why humans lost their body hair is that "human hairlessness evolved late in human evolution as a result of the adoption of clothing and the need to reduce the load of external parasites."¹¹

The existence of many different theories is a result of the fact that the loss of body hair is not explained by direct empirical evidence, allowing speculation to flourish. Nonetheless, gradual loss of hair is assumed in the artists' drawings showing the evolution of ape-like creatures into modern man. Images of early *Homo* are usually shown to be very hairy. The earlier in evolution they were claimed to exist, the more hair that was depicted on their bodies. Not only why the hair

in our putative ancestors was lost is unknown, but the origin of hair is also unknown:

“The phylogenetic origin of hair is conjectural. A protothrix hypothesis proposed by Elias and Bodner suggests that hairs may be modifications of hairlike bristles that emerge from certain sensory pits in the skin of lizards.”⁶

Human skin

All animal life has a protective covering, but the contrast between the skin of all animals and that of humans puts human skin in a class by itself. The number of human sebaceous glands per unit area is much larger than in all other primates, and the individual glands in humans are much larger than those in chimps, for example. On the downside, but still demonstrating uniqueness, only humans suffer from the sebaceous gland problem known as acne vulgaris, the dread of adolescents worldwide.¹²

Another difference is that while “skin pigmentation is a human adaptation to exposure to the hazards of sunlight, cutaneous pigmentation in many other mammals has little relevance to sunlight.”¹³ In apes, the fur itself shields against sunlight; shave a chimpanzee, and the skin underneath is ‘white’. This is ironic in light of the common racist belief that dark-skinned people are ‘closer to the ape’ than others. Even many evolutionists now concede that this notion has been greatly boosted by the iconic evolutionary images of human

evolution, most of which show skin colour progressively lightening as the image progresses from ape to human.¹⁴

Yet another

“... distinctive particularity of human skin is a blood supply greatly in excess of that needed for its metabolism. The human cutaneous blood-vascular supply performs major functions in the control of body temperature and blood pressure. In no other animal is skin so abundantly vascularized, not even in the great apes [Gorilla, Chimpanzee, Orangutan, Bonobo]. Actually, the vascularity of the skin of most non-human primates is essentially similar to that of other furred mammals.”¹⁵

Evolutionary expectations unmet

On the basis of evolution, one might expect human skin to be most similar to that of our supposedly closest relative, the chimp, and then the rest of the apes, and to monkeys. Ironically, though, human skin is more similar to pig skin than to any of these.¹⁶ Comparisons reveal “that from a skin structure perspective pigs [not chimps] are the closest to humans, even though here there are some noticeable differences.”¹⁵ The similarity of human skin and pig skin includes its anatomical, physiological, biochemical, and immunological properties.¹⁷ Debeer *et al.* found that antibodies displayed *equivalent immunoreactivity* to healthy human skin as to healthy porcine skin.

Furthermore, pig skin shares similar epidermal/dermal thickness ratios to human skin, plus similar hair follicle and

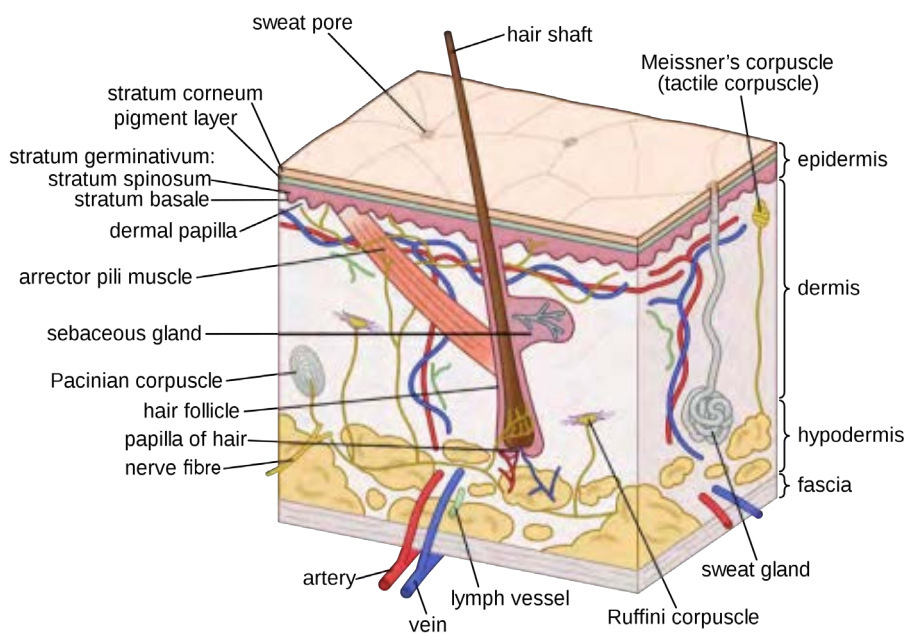


Figure 1. Human skin showing the three layers and the gland system

blood vessel patterns, biochemistry, dermal collagen, and elastin content.

Pig and human skin also display similar physical responses to growth factors.¹⁸ For research on skin reactions, such as reactions to cosmetics, pig skin is often preferred if human samples are unavailable.¹⁹

Anatomy of the skin

The three main skin layers of humans are the outer layer, the avascularized (i.e. without blood vessels) *epidermis*, the middle layer, *the dermis*, and the bottom layer, *the subcutaneous fat*, or *hypodermis* (see figure 1). The outer layer is the main skin barrier which gives skin its colour and contains specially designed immune cells. Cells called keratinocytes divide at the lowest levels of the epidermis. These new cells gradually push to the top layer where they are weathered by normal living activities. The cells in the top dead layer, the *stratum corneum*, eventually break away from the epidermis and fall off, making room for the newer cells growing below.

The average adult requires about a month for new cells to move from the bottom to the top layer. Consequently, in a month a completely new epidermis is produced. The healthy adult has 75,000 skin cells per cm² and every hour sheds over 2,500 of these, meaning we each shed some 200 million skin cells hourly.²⁰ These become the main component of house dust.

Human skin thickness varies, depending on age and the location on the body. The skin under and around the eyelids is the thinnest (0.5 mm thick) and thus is one of the first areas to show signs of aging as wrinkles. Conversely, the thickest skin on the body is on the palms of the hands and the soles of the feet (4 mm thick).²¹ The skin thins with age, beginning at age 35.

On average the human epidermis is much thicker than that of furred mammals, and has a conspicuous, well-structured second layer.⁶ The second layer is constituted mostly of keratinocytes connected by collagen and elastin fibres (see figure 2). All mammals are covered with hair, which in non-human mammals provides a significant level of protection. Human skin, by contrast, must be much thicker on average, and the outside layer, the *stratum corneum*, is highly keratinized to aid its role in protection.

The dermis is divided into a papillary layer (*pars papillaris*) and a reticular layer (*pars reticularis* in figure 2). It contains glands that manufacture a mixture of water and chemicals, collectively called *sweat*. The mixture travels through small tubes and exits from the small pores located on over 99% of the human body (see figures 1 and 2). Evaporation of sweat cools the body. Sweat glands also excrete small amounts of urea, a byproduct of protein metabolism.

Another set of glands located in the dermis are the sebaceous glands whose secretions keep the skin soft, smooth, and

waterproof. Human sebum is a “complex mixture of lipids [which] acts to reduce water loss from the surface of the skin and executes a thermoregulatory function. In addition, sebum has anti-microbial activity and is a source of antioxidants, including vitamin E.”²²

In addition, the human dermal layer contains a complex somatosensory system that perceives touch, pressure, temperature, pain and proprioception (the position of parts of the body). The receptors include tactile or Meissner’s corpuscles and Pacinian corpuscles. These tactile mechanoreceptors are found in the glabrous (hairless) skin of primates, including fingertips. Meissner’s corpuscles were found in higher densities in macaques and humans compared with bonobos and our closest ancestor, the chimpanzees.²³ Bulbous or Ruffini corpuscles are spindle-shaped receptors sensitive to skin stretch. They contribute to precision finger movement and are more common in humans. Their larger number in humans is one factor that accounts for the superior human skills, such as penmanship and the ability to play musical instruments such as the guitar and piano.²⁴

The inner of the three layers is the fatty sub-dermal layer, the *hypodermis*, which is the main insulation component that helps regulate the body’s requirement for a ‘goldilocks’ temperature. Our body needs to maintain a ‘not too hot and not too cold, but just right’ temperature, which for adults is between 36.1°C (97°F) and 37.2°C (99°F). The fat also serves as padding to help protect the bones and muscles from bumps and falls. This layer also contains the connective tissue that attaches the skin to the muscles and bones. Of interest is the fact that humans and pigs have firmly attached skins compared to most other small to medium-size mammals where the attachment is much looser.

Thermoregulation

The human skin was designed to be a major means of thermoregulation. Critical to this function is firstly the skin’s active vasodilation control. This allows higher levels of blood flow to the skin surface as required to cool the blood by dilating the small blood vessels. Crucial for this is also the large skin surface area, which is about 18,000 cm² (19 sq. ft) for adult men and 16,000 cm² (17 sq. ft) for adult women. It allows the heat to be dissipated quickly. Vasoconstriction is used to *reduce* the blood flow to the skin surface to preserve body heat. Adult human skin has about 18 km (11 miles) of blood vessels to achieve these goals. Other temperature regulation systems include sweating. Humans have from 1.5 to 4 million *eccrine* sweat glands, unique to humans both in terms of number and location over the entire body. The *apocrine* sweat glands are located mostly in the axilla, anogenital region, areola and nipple of the female breast, and the external auditory canal.²⁵ The eccrine secretions are highly hypotonic, containing fewer dissolved particles such

as sodium chloride and other electrolytes compared to normal cells and blood. Because of their higher relative water content, they are very effective in cooling.

To cool the body, adult human skin can release as much as 500 ml of water per day at rest in a cool environment, and up to 10 litres per day during exercise in the heat.²⁶

According to evolutionists, thermal regulation via sweating “was a key innovation in human evolution that allowed maintenance of homeostasis (including constant brain temperature) during sustained physical activity in hot environments.”²⁷ Furthermore, effective “Dissipation of heat is the function that most conspicuously distinguishes human skin from that of all other animals.”²⁸ Of note is that abundant sweating to cool the body “is particular to man: other primates sweat much less”.²⁹

Another difference between humans and non-human primates is that humans have a comparatively large “number of nerve endings around each hair follicle, regardless of size and location.”³⁰ This sensory information helps to trigger the production of heat, for example, by mechanisms including shivering (special muscle contractions that produce heat). Other mechanisms that help to optimize the balance between thermoregulation and cardiovascular strain in humans include a largely naked skin, upright posture, and bipedal locomotion, which results in a smaller area exposed to solar radiation, and more air flow to help cool the body skin. These, coupled with active vasodilation in response to heat load and, consequently, increased skin blood flow near the skin surface, combine to give humans a uniquely effective

cooling system. Last, as already noted, humans have a large skin surface area compared to almost all primates except a few of the great apes.³¹

Evolution

One major evolutionary scenario is that “hairs, feathers, and scales of extant species are homologous structures inherited, with modification, from their shared reptilian ancestor’s skin appendages”.¹ And the human hair/skin system is believed to have evolved from the last common ancestor of the human and chimp lineage. The problem is that both ideas lack fossil evidence.

The common reason evolutionists provide to explain the lack of fossil evidence to bridge the chasm between scales and skin is that soft tissue is usually not preserved in the fossil record. However, some keratinous structures, including claws, beaks, and hair, are better preserved in the fossil record under certain conditions than soft tissue.³² The hair on a fossil mammal discovered in Spain was dated at 125 million years old, and is considered the oldest example of preserved mammalian hair structures.³³ Because hair preserves better in the fossil record than skin, enough relevant fossil evidence exists to warrant a review by one research team of the idea that hair evolved from scales. They concluded that “The fossil record lacks any evidence of intermediate forms (hence, of homology) between scales and hairs.”³³

Further, this justification for the lack of evolutionary evidence ignores the fact that thousands of so-called ‘living

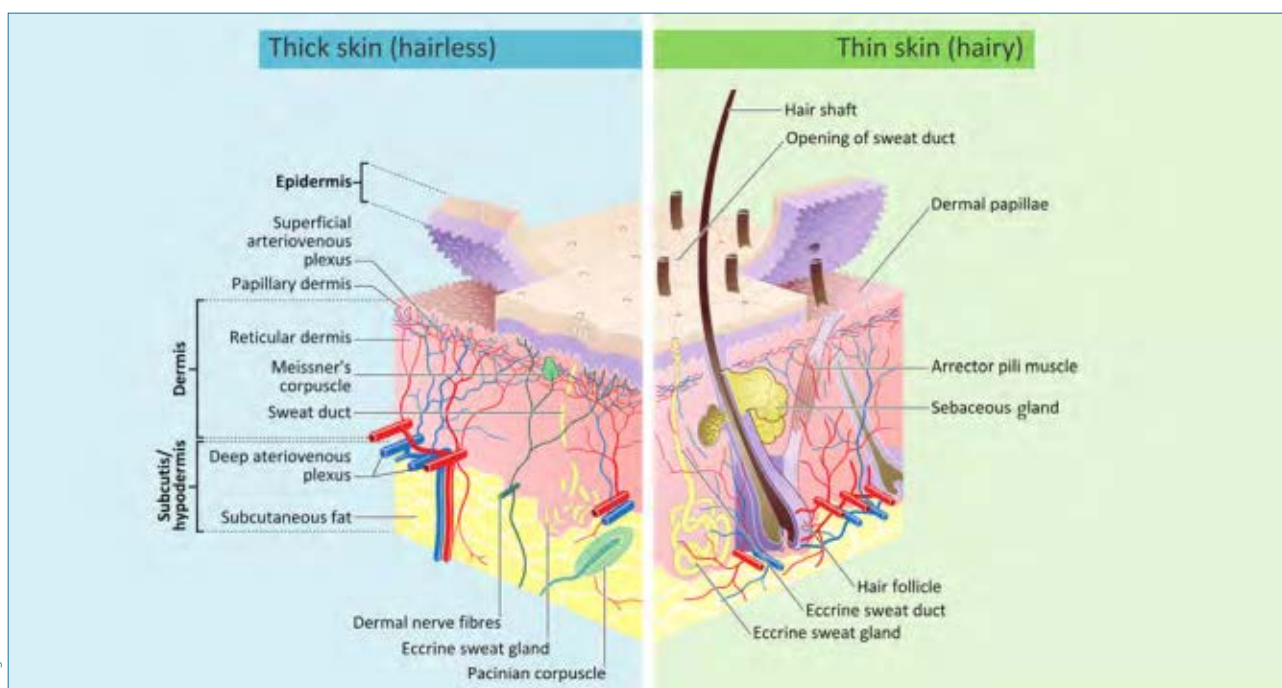


Figure 2. Comparisons of smooth and hairy skin

fossils' exist that are believed to be anatomically very little changed from their claimed multiple-millions-of-years-old designs.³⁴ At least some of these 'living fossils' would be expected to display evidence of a less-evolved skin organ—if it ever existed—that would bridge these two very different integumentary systems. But none of them do so.

Professor Jablonski, the leading researcher on the evolution of the human hair-skin system, concluded:

"Reconstruction of the evolution of human [hair/] skin relies on evidence provided by comparative anatomy and physiology, as well as study of the evolution of the genes and gene complexes that determine the function and pigmentation of skin. Using basic principles of historical morphology, one can reconstruct the major steps in the evolution of human skin by utilizing a well-established phylogeny to examine historical transformations of structure and function (Jablonski & Chaplin 2000). This method leads to the reconstruction of the probable appearance of the skin in the last common ancestor of the human and chimpanzee lineages as being lightly pigmented and covered with dark hair, like most catarrhine primates today (Jablonski & Chaplin 2000)."³⁵

The problem with this claim is that by their nature, such 'reconstructions' are not based on any direct evidence, but on the assumption that there really was such a 'last common ancestor' of humans and chimps. Circularity is inevitable.

Evolutionists admit that the gap between human skin and that of primates is enormous, writing that "The evolution of mostly naked skin in the human lineage heralded major changes in the biological and social functions of skin."³⁵ These changes include the enhanced barrier of the thick epidermis for naked skin lacking a protective fur covering "to repel water, resist abrasion, and combat harmful microbes and ectoparasites. Naked skin also changed the nature of human social interactions, both at a distance and at close quarters ...".³⁵ Evolutionists lack specifics, however, confessing that "many of the details of exactly what happened when are not yet known."³⁵

One theorized result of hair loss was that raising hackles became no longer possible, meaning that the animal could no longer cause hair on the back of its neck to stick straight up to convey aggression or other strong emotions.³⁶ Consequently, displays of fear, anger, aggression, and excitement required enhanced facial expressions:

"With the loss of most body hair, grooming became more focused on scalp hair and the face, and huddling for thermoregulation probably became more important. Erogenous zones and increased sensitivity of facial skin promoted infant-mother and pair bonding. Naked integument almost certainly became a canvas for social expression early in the history of *Homo sapiens*, if not earlier, and the communication functions

of temporarily and permanently decorated skin have only increased over the millennia. As visually oriented primates, humans attend closely to the appearance of skin and make assessments of age, health, and group membership based on it."³⁵

Evolutionists concede that skin is "generally not preserved in the fossil record and so details of its evolution can be gained only from comparative anatomical and physiological evidence."³⁷ Nonetheless, "continued study of the evolution of human skin and skin color is important, not only to our realization of a more complete picture of human evolution, but also it is important because the skin is involved in so many aspects of human well-being."³⁸

Conclusion

A chasm exists between the integumentary system of humans and its potential evolutionary precursors. A significant difference would have had to exist between modern human skin and the commonly assumed animal-human skin of the alleged common ancestor of humans and chimpanzees. No valid empirical evidence exists to bridge this gap. As Montagna admits,

"In searching for evolutionary clues to learn more about such disparate organs as the skin of humans and non-human primates, one is repeatedly forced to grasp at straws. But if one is willing to temper fancy with what facts are at hand, the results make for an amusing, if not entirely convincing, revealing story."⁵

Such a story is convincing only if one is already fully convinced of human evolution. The origin of hair itself is a topic that would require a separate paper, but suffice it to say that

"Hair origin from synapsid scales is speculative and requires extensive modifications of the morphogenetic process transforming lens-shaped dermis of scales into small dermal papillae in hair. Hair evolution from glands is hypothetical but is supported from studies on the signaling control of hair vs glandular morphogenesis."³⁹

As Montagna admits, "Neither this nor the other essays in this volume is[sic] free [of] speculation and assumption. But this is the best that can be done in the absence of hard facts."⁴⁰ He says: "This situation has not changed—very little has been added to our knowledge of the comparative cutaneous biology of primate skin during the last five years."⁵ And also, "Since human skin is very different from that of all other known mammals, its evolution has very likely been unique."⁵

No evidence for the evolution of skin, and the hair that covers it, exists; rather the clear evidence of its functional complexity and superb design, and the inherent implausibility of all evolutionary scenarios to date, are strongly consistent with an *ex nihilo* creation.

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The problematic evolution of mammary glands: milking the ‘sour’ evidence for all it’s worth

Jerry Bergman

The evidence for the evolution of the human mammary gland was reviewed. While many theories have been proposed, all have been either refuted or are very problematic. The main difficulty with any evolutionary theory of the mammary gland system is that it requires a large set of complex structures to function, for which no evidence of viable evolutionary precursors exists. It has even been very difficult to propose ‘just-so’ stories to explain how it could have evolved. As admitted by the leading researcher in the field, “the origin of the mammary gland is one of several unresolved issues that hamper attempts to reconstruct the evolution of lactation.”¹

All female mammals, by definition, possess mammary glands in order to feed their young. In most cases, their young are born alive, and require breast milk to survive. The term *mammal* is Latin from *mamma*, meaning breast. Other major mammalian characteristics include a neocortex (a complex region of the brain), fur or hair, being warm-blooded, having a four-chambered heart, and possessing three middle-ear bones. Mammals live in nearly every habitat on Earth, from the deep seas, to tropical rainforests, and in sandy or icy deserts. They range in size from one-ounce shrews to 200-tonne whales. Mammals are also some of the most familiar animals, including dogs, sheep, horses, squirrels, and mice.

The highly complex mammary gland design

The mammary gland is a sophisticated and complex system used in all mammals, but in no other vertebrates. The focus in this discussion is on the human mammary gland or breast (figure 1). The breast in other primates, the udder in ruminants (cows, goats, and deer), and the dugs (nipples, teats) of other animals (e.g. dogs and cats) are not covered.

Milk-secreting cells produce the milk

The milk-secreting cells (*lactocytes*) are the heart of the mammary gland, within small sacs a few millimetres in size, called *alveoli*, which are themselves clustered into *lobules* (figures 2 and 3). The hormone *prolactin* stimulates the lactocytes to produce milk. These lactocytes are surrounded by *myoepithelial* (smooth muscle) cells which contract when stimulated by the hormone *oxytocin*, squeezing the milk into small *ductules*, which lead into a larger lactiferous

duct within each lobule. This drains towards the nipple. As the infant begins to suck, the oxytocin-mediated ‘let down reflex’ ensures that the mother’s milk does not require the infant to suck from the gland, but rather it is secreted into the baby’s mouth.

Milk-secreting tissue leading to a single lactiferous duct is called a ‘simple mammary gland’. Humans employ a ‘complex mammary gland’ system. In this design every simple mammary gland leads via the lactiferous duct system into one nipple. Humans have two complex mammary glands, one in each breast, and each complex mammary gland is composed of up to 20 simple glands. The myoepithelial cells are in turn surrounded by a *basement membrane*, which is in contact with the mammary *stroma*. This consists of an extracellular matrix (ECM), together with adipocytes (fat cells), fibroblasts, endothelial cells and various immune and other cells.² The basement membrane of these myoepithelial cells (figure 3) not only helps to support the mammary structure, but also serves as a communicating bridge between mammary epithelia and their environment throughout this organ’s development. In addition, the system is served by a complex network of nerves, veins, arteries, capillaries, various ligaments plus a system of muscle and connective tissues.

The central role of the hormone system

Breast development and function requires the presence of a complex system of hormones. These hormones include those that cause or support mammogenesis (breast development that begins during puberty). Without the required hormone levels, the breasts would never develop and, therefore, this must be included when considering the evolution of these glands. Increased breast maturation and size during

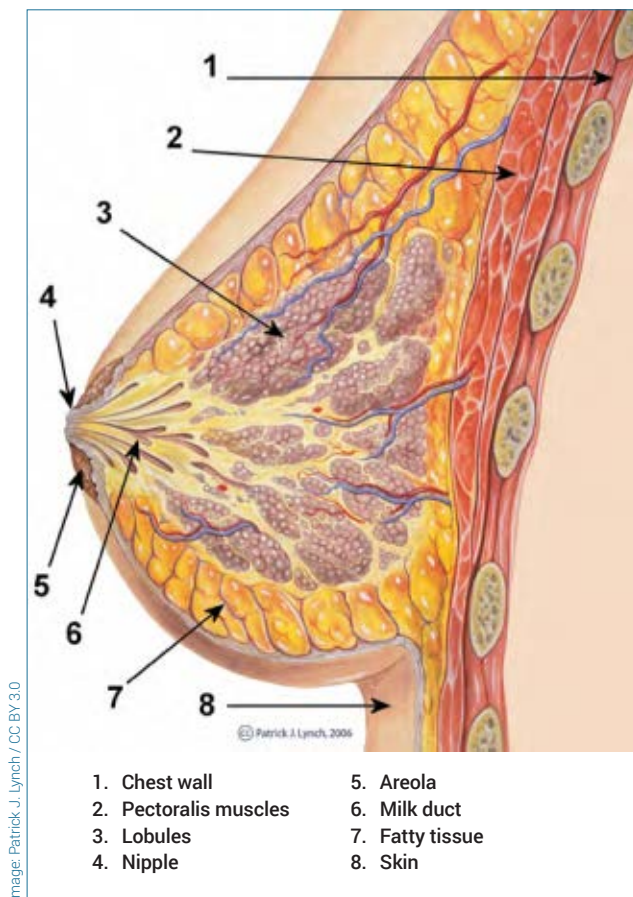


Figure 1. Cross-section of the human mammary gland

pregnancy is due primarily to estrogen, while the required lobuloalveolar development is facilitated predominantly by progesterone. The support of these and other hormones, including prolactin and placental lactogen, is required to cause breast glandular tissue to further differentiate. In addition, hormonal support causes the alveolar epithelium to proliferate and become secretory.³ The complex interplay between breastfeeding and hormone production (via positive feedback) must be functional and in place to produce and secrete milk of the required composition. Only when all of these systems are in place can the mother breastfeed her child.

The complexity of milk

The milk-secreting lactocytes are the heart of the system because it is they that manufacture the milk to exacting conditions.⁴ Specifically, they formulate the contents of human breast milk which is (by volume) about 0.9% protein, 4.5% fat, 7.1% sugar and carbohydrates (mostly lactose), and 0.2% minerals.⁵

Research since the 1970s has documented that human breast milk is far more complex than naively thought before that time.⁶ As will be discussed, these findings have created major problems for all breast-related evolutionary theories. It has been shown experimentally that human breast milk is by far best for human infants because it is *designed* for the specific needs of human health.

For example, the proteins in human breast milk (which include casein, albumin, and alpha-lactalbumin) contain all 20 amino acids found in proteins. That includes the 9 essential amino acids, that cannot be manufactured and are needed in the diet. These essential amino acids are present in human breast milk in a pattern which “closely resembles that found to be *optimal* for human infants [emphasis added]”.⁷ The protein lactoferrin in breast milk has an important role in iron-binding and absorption, and also the regulation of the infant’s developing gut flora (the ‘good bacteria’ in the large bowel). Breast milk also contains lysozyme, produced by macrophage cells. This enzyme, also produced in tears, has significant antibacterial properties.

The most common sugar in human milk is lactose, but 30 or more other oligosaccharide sugars are also found. The principal mineral constituents in human milk are sodium, potassium, calcium, magnesium, chlorine, and phosphorus.⁷ Besides these essential components, every required vitamin is in human breast milk in nutritionally significant concentrations—except for vitamin K, which is only in very low concentrations.⁸ Vitamin K is central for blood clotting, and may cause problems in newborns, thus it is not produced by the infant but rather by the bacteria that progressively colonize the large bowel at maximum clotting levels until eight days after birth. Probably for this reason, God instructed the Jewish people to circumcize males only on, and not before, the eighth day (Leviticus 12:3; Luke 1:59; 2:21; Philipians 3:5).

Lastly, human breast milk is made up of close to 5% fat, including phosphatidyl ethanolamine, phosphatidyl choline, phosphatidyl serine, phosphatidyl inositol, and sphingomyelin.⁸ These complex milk requirements are problematic for evolution because survival was seriously compromised, if not impossible, until the complex mix that enabled the newborn to live existed. This required virtually all of the components listed above to be within the required tolerances.

Breast milk strengthens the immune system

Human breast milk also strengthens the newborn child’s immune system by several mechanisms. One important protein is critical to confer protection from pathogens, namely immunoglobulin A (IgA). IgA protects the large, vulnerable outer surface of the gastrointestinal, respiratory and genitourinary tracts.⁹ These areas are the major sites of attack by invading pathogenic microorganisms. IgA, the principal

antibody class in the secretions that bathe these mucosal surfaces, is a critical first line of immune defence.

IgA is also an important serum (blood) immunoglobulin, mediating a variety of protective functions. It acts through interaction with specific receptors, such as the pIgR receptor located on mucosal cells. IgA also protects the immune mediators supporting the body's intestinal flora,¹⁰ the important bacteria and other microorganisms that live inside of the intestines.¹⁰ One reason for this protection is that intestinal microflora manufacture certain vitamins, including biotin and vitamin K.

The specific details of how the microflora and their molecular support systems are maintained have largely remained elusive until recently. Part of the answer is a class of proteins called *alarmins* that prevent intestinal colonization disorders that can lead to blood poisoning and intestinal inflammation.¹¹ A Hannover Medical School (Germany) research team has concluded *alarmins* are important in maturing postnatal intestinal flora and mucosa through interactions with bacteria in the environment. They give rise to optimal bacterial diversity, and protection against many diseases.

This adaptation process is controlled by peptides and proteins derived from breast milk that arise in the child's intestinal tract.¹² Specifically, they determine that S100 calcium binding proteins (S100A8 and S100A9, and their extracellular complex form, S100A8–A9) are present in high levels in human breast milk. The Hannover team also observed that only a single dose of alarmins in mice conferred some protection against poor bacterial colonization and associated diseases.¹³

To properly nourish the infant, the milk-secreting cells must ensure these components are in the milk within the required narrow tolerances. Too high or too low amounts of each component can be lethal for the infant. To help ensure this balance, the mother's body puts the child's needs above her requirements, and dietary recommendations for the mother reflect this. Of note is the fact that race, age, or even healthy diet variations do not usually significantly affect milk composition. Furthermore, milk from each breast is compositionally equivalent to ensure that the infant consistently receives essential nutrients regardless of which breast is used for feeding.⁸

Theories of the gland's evolution

Many theories exist on how mammary glands could have evolved.¹³ The main problem for evolution, then and now, is

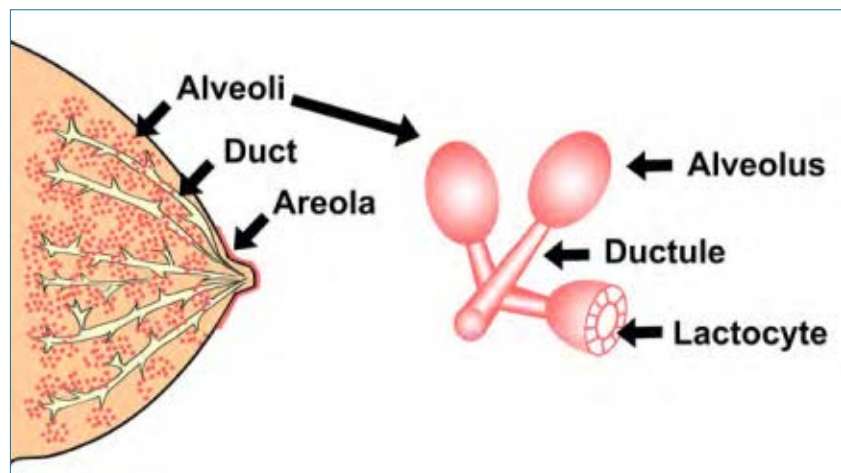


Figure 2. The alveoli clustered within lobules

that, as described above, the system is horrendously complex. It will not operate properly until all of the many required components are in place and functioning:

“The presence and secretory capacity of the mammary gland provided the basis for the taxonomic grouping of species into the class Mammalia more than two centuries ago; and Darwin’s explanation of how lactation may have evolved satisfied an early challenge to his theory of evolution by natural selection. The challenge was that evolution of lactation was not feasible, because a neonate could not obtain a survival benefit from consuming the chance secretion of a rudimentary cutaneous gland.”¹⁴

To respond to this challenge,

“Darwin hypothesized that mammary glands evolved from cutaneous glands that were contained within the brood pouches in which some fish and other marine species keep their eggs, and provided nourishment and thus a survival advantage to eggs of ancestral species. Two hundred years after Darwin’s birth, ... it is now clear that the mammary gland did not evolve from a brood pouch.”¹⁴

The innate problems of Darwin’s conjectures have forced evolutionary theorists to move on to other hypotheses. The most common evolutionary speculation today postulates that the mammalian breasts evolved from some type of sweat glands: “Lactation appears to be an ancient reproductive feature that predates the origin of mammals. ... the mammary gland is hypothesized to have evolved from apocrine-like glands associated with hair follicles.”¹⁴ Note the words ‘appears’ and ‘hypothesized’ used in this explanation. This claim is rank speculation.

Another claim is that the mammary gland is a highly evolved skin gland, but which one has not been

demonstrated.³ After reviewing a dozen theories, Professor Blackburn concluded that “Of the numerous structures that have been hypothesized to have given rise to the mammary gland, only three remain as plausible progenitors: sebaceous glands, eccrine glands and apocrine glands.”¹⁶ (The latter two are categories of sweat glands.)

Because mammary glands are constructed from soft tissue, they rarely fossilize. Consequently, current theories are based on comparisons between living mammals—specifically monotremes (egg-laying mammals), marsupials (pouched mammals), and eutherians (placental mammals). The leading researcher in this field, Professor Olav T. Oftedal, asked the still unanswered queries regarding breast-gland evolutionary origin:

“Many scenarios disregard the fossil record, but those that do address mammalian ancestry argue that lactation had evolved in the earliest mammals but without specifying when lactation first appeared. Did lactation suddenly blossom on the evolutionary tree as an evolutionary novelty, or did it evolve gradually and incrementally, as Darwin thought? It is easy to be confused by the plethora of hypotheses, many of which sound attractive but have little predictive value, and cannot be falsified.”¹⁷

Nonetheless, despite these problems evolutionary theories abound. One popular theory proposes that mammary glands evolved from glands used to keep the eggs of early mammals moist.^{16,18} Of course, an enormous gap exists between glands supposedly used to keep the eggs of early mammals moist and any that would be capable of generating even very simple milk formulas. JBS Haldane (1892–1964) suggested that the ancestors of mammals moistened their fur by bathing. Thirsty hatchlings benefited from sucking on the wet fur, including fur moistened by sweat. And from this sweating, mammary secretions evolved.¹⁹

Other theories suggest that early secretions were used directly for nutrients by hatched young and only later the gland evolved.²⁰ Other researchers suggested that secretions were used by young to help them orient to their mothers.²¹ These secretion theories only move the origin of milk glands further back in time. They still have to explain the origin of the lactation secretion system cells described above which must exist before they can evolve into functional mammary glands.²² One theory even speculated that the mammary gland evolved *de novo* from the embryonic ectoderm and mesenchyme.²³

Another proposal is that the mammary gland evolved from components of the innate immune system. As explained by Professor Vorbach:

“The purpose of the mammary gland is to provide the newborn with copious amounts of milk, a unique body fluid that has a dual role of nutrition and

immunological protection. Interestingly, antimicrobial enzymes, such as xanthine oxidoreductase or lysozyme, are directly involved in the evolution of the nutritional aspect of milk. We outline that xanthine oxidoreductase evolved a dual role in the mammary gland and hence provide new evidence supporting the hypothesis that the nutritional function of the milk evolved subsequent to its protective function.”²⁴

The logic of this assumption is that the mutation(s) that changed the sweat composition to enhance its innate immune functions facilitated health and survival, and thus were selected by natural selection.²⁵

Immunoprotective gland theory

American biologist Professor Paul Z. Myers supports the theory that the mammary gland originated from an immunoprotective gland which helped keep the animal free from infection.²⁶ Myers ignores the problems of the origin of the immunoprotective gland system, which must be assumed to exist before its evolution into functional mammary glands can occur. He admits:

“It’s a speculative story at this point, but the weight of the evidence marshaled in support of the premise is impressive: the mammalian breast first evolved as an immunoprotective gland that produced bactericidal secretions to protect the skin and secondarily eggs and infants, and that lactation is a highly derived kind of inflammation response.”²⁶

No evidence supports the conclusion that immunoprotective glands could produce anything even close to nutritionally supporting complex animal offspring. It also begs the major question: how did the young survive until the immunoprotective glands evolved? All of these possibilities are mere speculation, “Because the mammary gland has no known homologue among the extant reptiles, [and thus] attempts to reconstruct its evolution must focus on evidence from living mammals.”¹⁷

Therefore, some evolutionists propose that *viviparity* (the development of the embryo inside the body of the mother followed by live birth) evolved *first* and was succeeded by *oviparity* (production of young by means of eggs that are hatched *after* they have been laid by the mother). This theory is the reverse of the standard evolutionary theory. The required hormones must have first evolved, then the milk ducts and nipples, followed by the other accessory organs.²⁶ Nevertheless, we see once again that the problem is that many systems must have evolved separately, yet somehow managed to operate together as a functional unit.

The problem with all of these theories is that they ignore the other very effective methods of feeding infants. The two main alternatives include: eggs which supply the nutrients

until the young hatch, and infants born at the point of development where they can fend on their own. Some mothers feed their young with food taken from the environment, such as robins feeding their young until they are mature enough to leave the nest. Given how common and successful these methods were (allegedly going far back in history), what factors would favour mammals to evolve breastfeeding, given that the feeding methods noted above are very successful?

1. Transitions from these infant feeding systems to the mammal system are recognized as so difficult that even ‘just-so’ stories are rare, and are generally admitted to be very speculative. The big problem for evolutionary theory is that the key breast structures are largely useless until they exist as a functional unit that can nutritionally support the infant.
2. Finally, another theory would have us believe that mammary gland secretion originally evolved as a means of supplying water to parchment-shelled eggs, theorizing that “... mammary gland secretions first evolved in synapsids that laid parchment-shelled eggs. Unlike the rigid-shelled eggs of birds and some other sauropsids, parchment-shelled eggs lose water very rapidly when exposed to ambient air of lower vapor pressure, whether due to differences in relative humidity or to

differences in temperature. ... mammary secretion may be an ancient trait of egg-laying synapsids, having had an important role long before milk became obligatory for suckling young.”¹³

In response to some of the early theories of breast evolution, specifically evolution from some cutaneous secretory gland, the eminent St. George Mivart correctly observed:

“Let us consider the mammary gland, or breast. Is it conceivable that the young of any animal was ever saved from destruction by accidentally sucking a drop of scarcely nutritious fluid from an accidentally hypertrophied cutaneous gland of its mother?”²⁷

Conclusion

All attempts to support a theory of human breast evolution are either problematic or have been rejected. Most are fanciful imaginary ideas totally lacking in empirical support. This was recognized a century ago by Professor Ernst Bresslau who wrote:

“None of the many attempts to explain the phylogeny of the mammary apparatus, or parts of it, has been able to withstand searching criticism. They have all failed because of the discrepancies between theory

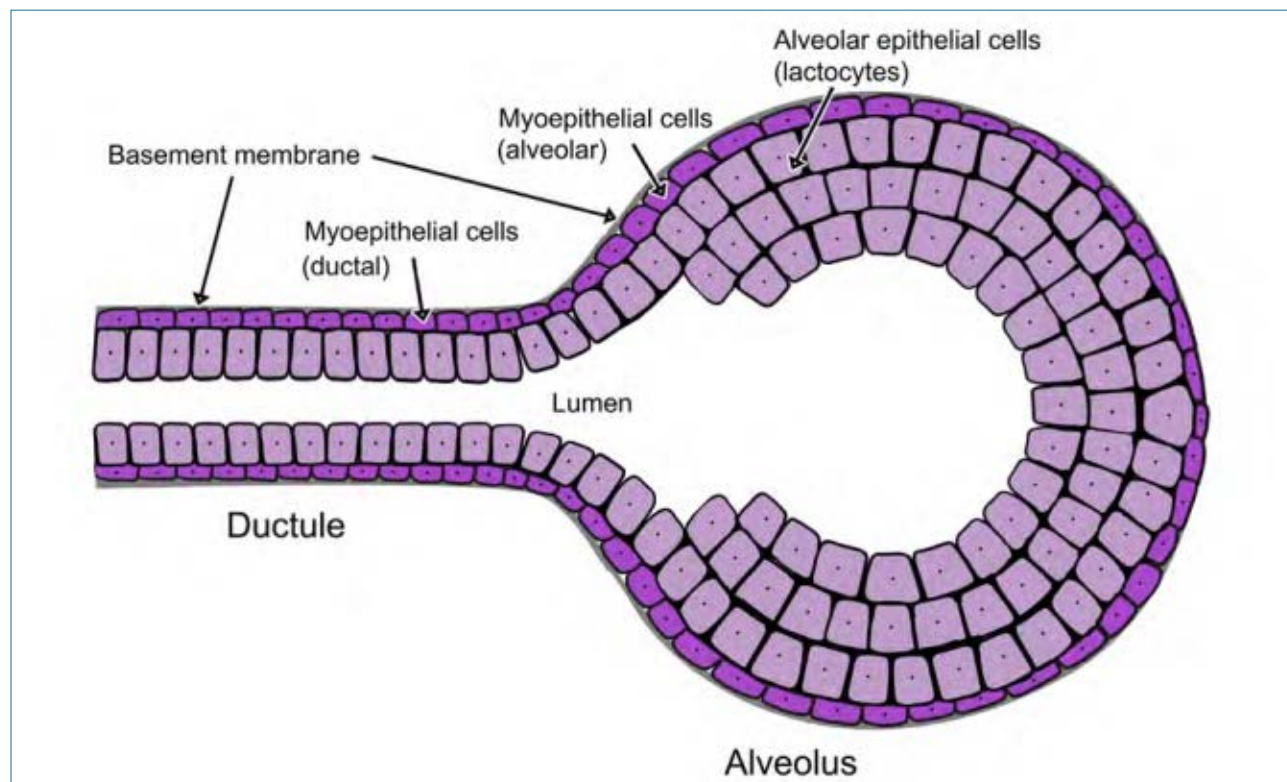


Figure 3. A simple illustration of the relationships of the fundamental layers in the alveoli and ductules. The (myoepithelial) basement membrane surrounding all is in contact with the surrounding stroma.

and facts which come to light when one follows these speculations to their logical conclusion.”²⁸

The same generalization is still very valid today. As research has progressed, the breastmilk feeding system has proven to be more and more complex, increasing the contrast between other biological systems used to provide nutrients to newborns. Many newborns are fed by the mother, such as is true of many birds (e.g. robins feed their brood worms). Others must fend for themselves, such as newborn turtles.

Aside from logical guesses, no evidence exists to explain the evolution of the highly complex mammalian milk-feeding assemblage, and therefore trying to explain its evolution will continue to remain elusive. As Blackburn summarizes: The “literature on the evolution of lactation presents the history of valiant but unsuccessful attempts to link the mammary apparatus to a single extant population of integumentary glands.”²⁹ Blackburn, as an evolutionist, concluded that we should give up on searching for a glandular precursor to explain the origin of the mammary gland. Recognizing that complex structures arise through the modification of genes controlling developmental pathways, he concluded we should focus on genetic analysis.³⁰ This approach also will likely fail as it has in all other attempts to determine the evolution of new organs by the analysis of evolutionary relationships using genetic comparisons.

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Ice core oscillations and abrupt climate changes: part 4—abrupt changes better explained by the Ice Age

Michael J. Oard

Uniformitarian scientists do not really know the cause of the millennial scale fluctuations. The millennial scale deuterium isotope oscillations in the Antarctic ice cores, Antarctic Isotope Maxima (AIMs), are much weaker than the Dansgaard-Oeschger (D-O) events in the Greenland ice cores. Scientists suggest millennial changes are caused by changes in the Atlantic Meridional Overturning Circulation (AMOC), although the adequacy of this hypothesis is questionable. Just like with the large deuterium isotope oscillations in the lower 1,500 m of the East Antarctic ice cores, millennial scale oscillations can be explained as climate changes caused by shorter scale oscillations (on the order of decades) in volcanism in the Creation/Flood/Ice Age model. The fluctuations of other variables can also be explained by this mechanism. This difference between hemispheres can be explained by different volcanic scenarios between the hemispheres. The paradigm shift in glaciology to abrupt climate changes has fuelled the global warming scare. However, these abrupt changes occurred during the Ice Age portion of the ice cores and so do not apply to today.

In part 3,¹ I showed how the large-scale isotope oscillations in the Greenland, West Antarctic, and East Antarctic ice cores can be explained within the biblical Ice Age model. The bottom 1,500 m of the East Antarctic ice cores can be explained by rapid buildup of ice within about 200 years after the Flood. This part delves into the presumed millennial-scale ice core oscillations in the Ice Age portion of the Greenland and West Antarctica ice cores, and the top half of the East Antarctic ice cores.

Abrupt climate changes a uniformitarian mystery

Dansgaard-Oeschger (D-O) events are claimed to be abrupt climate changes of about 10–20°C, based on the oxygen isotope ratios in Greenland ice cores. These 25 ‘millennial-scale’ fluctuations during the last uniformitarian ice age supposedly initiated in about a decade and remained in that new climate state for about 1,470 years, before changing back (figure 1). Understandably, the meaning of D-O events in the Greenland ice cores (see part 1²) is unknown: “The significance of Dansgaard-Oeschger (DO) events, observed in the Greenland cores, is debated.”³ These events are truly a radical climate change, and there is much speculation as to their cause:

“The demonstration that natural climate variability during the last glacial cycle shifted rapidly between remarkable extremes has dramatically revised the understanding of climate change.”⁴

Vettoretti and Peltier acknowledge this major problem: “One of the most enigmatic and energetically

debated problems in paleoclimate research continues to involve the development of a consensus theoretical understanding of the mechanisms that underlie the millennium time-scale oscillations of glacial North Atlantic climate.”⁵

Sarnthein *et al.* admit: “The origin of major rapid, decadal climate change during the latest Quaternary remains an enigma.”⁶

Many other variables are correlated with the oxygen isotope ratios. One of these is carbon dioxide in the gas bubbles within the ice, which is roughly correlated with $\delta^{18}\text{O}$ in Greenland ice cores (figure 2). However, we must be careful correlating CO_2 between various ice cores and between Antarctic and Greenland ice cores at the supposed same times.⁷ These are differences in the amount of CO_2 probably because of chemical changes with dust and the addition of CO_2 in melt layers. But the abrupt changes in CO_2 present a major uniformitarian problem: “... thus, the dilemma of the fast CO_2 variations during the glaciation discussed by Oeschger *et al.* [1998] remains.”⁷

Ever since D-O events were inferred, climate models have attempted to duplicate them with little or no success.⁸ These models even have high resolution atmospheric, oceanic, and ice sub-models. For instance, Drijfhout *et al.* did not apply any external forcing but attempted to obtain D-O events by an atmospheric blocking pattern that increases North Atlantic sea ice and changing the three-dimensional ocean circulation. A blocking pattern is one in which a particular configuration of the atmospheric circulations remains stationary for a while. Drijfhout *et al.* only obtained cooling similar to the Little Ice

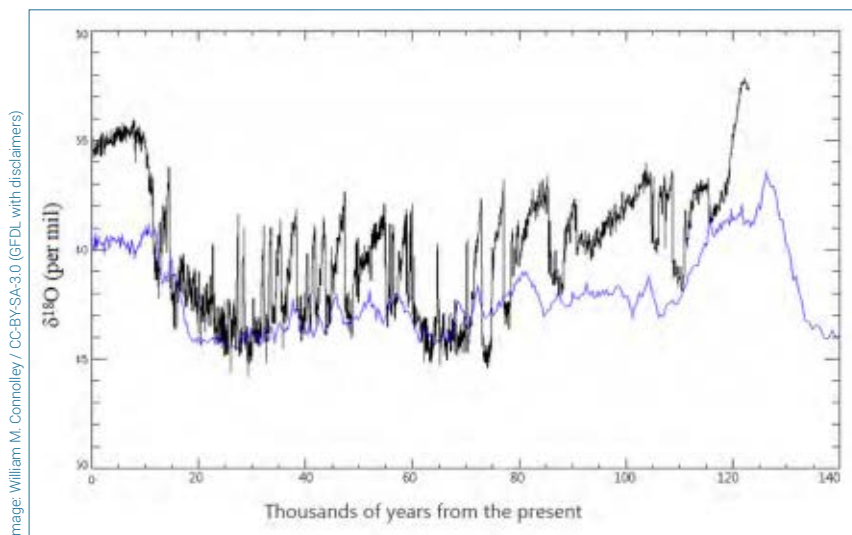


Figure 1. The NorthGRIP, Greenland, and Dome C, East Antarctica, millennial isotope oscillations showing the abrupt changes in oxygen isotope ratio for Greenland but not for East Antarctica

Age^{9,10} between about AD 1400 and 1850, of 0.8°C for 100 years. Unfortunately, atmospheric blocking patterns today usually last a week, but in some situations can last longer.¹¹ So, a blocking pattern in the North Atlantic does not seem like a good trigger for even a 100-year cooling from the average, not to mention one about 1,500 years long.

It is possible that the abrupt changes in the oxygen isotope ratios do not totally represent temperature change, since there are many other variables that change the oxygen isotope ratio. Carl Wunsch, an atmospheric scientist from MIT, believes that such high amplitude millennial oscillations in the Greenland ice cores may not represent huge temperature changes, but could be caused by wind trajectory shifts, which can substantially change the oxygen isotope ratio.¹⁶ So, maybe the temperature changes in the Greenland ice cores are not that drastic. To address the possibility that the oxygen isotope ratios do not entirely reflect temperature changes, glaciologists analyzed other paleothermometers, the nitrogen isotope ratio, $\delta^{15}\text{N}$, and the argon isotope ratio, $\delta^{40}\text{Ar}$, in the air bubbles.¹² The researchers discovered that the temperature change was twice as much as indicated by oxygen isotope ratios, at least for some D-O events!

Weak and few D-O events in Antarctica

‘Abrupt’ climate changes are also claimed in the Antarctic ice cores, but they are much different than those in Greenland (figure 1). The West Antarctic millennial scale oscillations are similar to those in the East Antarctic ice cores above 1,500 m. However, the Antarctic oscillations are weak.¹³ Whereas Greenland ice cores show 25 D-O events between 20 and 105 ka, the Antarctic ice cores show much fewer, about 7–9,

with the inferred temperature change of only about 2°C.^{14,15} Wunsch finds about seven Antarctic Isotope Maxima (AIMs) in the Byrd core.¹⁶ Moreover, these AIMs show decreasing deuterium isotope oscillations going up the core, probably reflecting a general cooling trend due to the increasing height of the Antarctic Ice Sheets.

The wiggles in the Antarctic ice cores are not correlated well with the D-O events in the Greenland cores.¹⁷ However, this has not stopped researchers from trying to correlate these wiggles between Greenland and Antarctica (see part 2,¹⁸ figure 7). Researchers have a tendency to correlate oscillating variables, even when no relationship actually exists.^{19,20} So, stretching out the timescale of the Antarctic ice cores,

they obtained more little wiggles, probably representing a temperature change of 1°C or less. So, the uniformitarian scientists were able to ‘find’ more slight oscillations to correlate with Greenland.²¹

The AIMs are of opposite temperature of the D-O events, based on methane correlations. When a D-O event in Greenland cools drastically, the temperature is believed to warm a little in Antarctica, and vice versa. Even the last fluctuation at the top of the ‘last ice age’ in Antarctic ice cores, called the Antarctic Cold Reversal (ACR),²² is much weaker than the corresponding Younger Dryas in the Greenland ice cores. The fluctuations are also out of phase.²³ In referring to the ACR, Stanley writes: “Researchers must now find an explanation for the unusual asynchronicity during the Younger Dryas.”²⁴

The changes in temperature are also not abrupt in Antarctica; the change occurs slowly. Just as there is a lack of a uniformitarian mechanism to explain Northern Hemisphere D-O events, there is a lack of a mechanism to produce AIMs.

This asynchrony of the abrupt oscillations in the hemispheres has given rise to the idea of the bipolar see-saw that connects D-O events in the North Atlantic to AIMs in Antarctica. The scientists believe the connection is caused by an interhemispheric redistribution of heat by the Atlantic Meridional Overturning Circulation (AMOC). However, there are major questions about the adequacy of this mechanism as well as what causes D-O events, and models fail to explain them.^{25,26}

Slowing or stopping AMOC?

The most popular hypothesis that would cause D-O and Heinrich events is the stopping or slowing of the

three-dimensional Atlantic Meridional Overturning Circulation (AMOC). Heinrich events are warmer climatic events causing ice rafted debris observed in marine deep-sea cores of the North Atlantic Ocean. They are believed to be caused by an armada of icebergs that broke from the Laurentice Ice Sheet every 7 to 15 ka. In AMOC, warm water is transported from the tropics northward to Greenland and northern Europe. The Gulf Stream current off the eastern United States is part of this poleward warm ocean water transport. The warm water warms the air while the ocean water cools. The water in the northern North Atlantic cools so much and evaporates so much water into the atmosphere that it becomes saltier and denser. It then sinks and flows south in the deep ocean, all the way to the South Atlantic Ocean. Branches flow slowly west into the deep Pacific Ocean and east into the Indian Ocean. This is also referred to as the ‘conveyor belt’. The deep water is believed to upwell close to Antarctica, and since the water is supposed to be cooler, Antarctica cools while Greenland warms.

To reverse the temperature changes, scientists believe that the warm North Atlantic current slows down or completely stops. Without a warm current from the south, the atmosphere of the North Atlantic cools.²⁷ The ocean water is not cooled and the flow of AMOC slows or fails to spread any cooler water into the Southern Hemisphere. Thus, Antarctica is supposed to warm while Greenland cools.

The idea sounds good in theory, but it has major flaws. First, what would cause the AMOC to slow or stop? One idea is if abundant fresh water from either melting sea ice or intense continental runoff from warmer temperatures in the warm phase flowed into the ocean. The less dense fresh water would tend to float on the dense salt water for a while, but it would gradually mix with time. The quantitative adequacy of this mechanism has not been worked out.

A second problem is that the cooler deep water may not be able to reach Antarctica because the Antarctic Circumpolar Current that flows around the continent may be a barrier for any transport from the north by AMOC.^{28,29} So, the AMOC mechanism remains speculative: “Despite dedicated efforts to pin down the AMOC hypothesis, there are still unresolved issues.”³⁰

Decadal volcanic fluctuations explain ‘millennial scale’ oscillations

I have suggested several times in the past that the cause of such drastic oxygen isotope changes was caused by *decadal* changes in volcanic aerosol loading in the stratosphere. A decadal timescale means that the oscillations can vary from a few years to several tens of years, based on high ice accumulations rates early in ice buildup. The decadal scale peaks and lulls are superimposed on a general decrease in volcanism

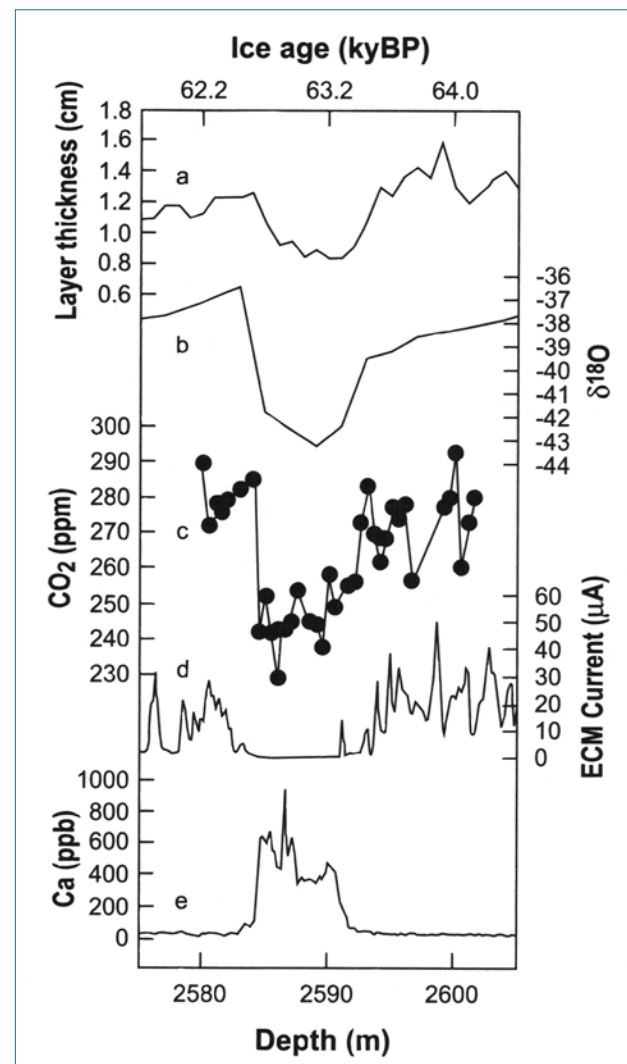


Figure 2. One abrupt climate change showing how many other variables are correlated to the oxygen isotope ratios in the GISP2 ice core from central Greenland (from Smith *et al.*, 1997, p. 26579)

with time (figure 3).^{31,32} I suggested that such decadal changes caused the ‘glacial/interglacial oscillations’ in the bottom 1,500 m of the East Antarctic ice cores (see part 3).¹

When analyzing the heat balance equations for the ocean and atmosphere, I discovered that the amount of volcanic ash and aerosols in the upper atmosphere controlled the rate of ice sheet growth. During periods of strong volcanism, colder temperatures occur with greater snowfall. The colder temperatures result in lower oxygen isotope ratios. The opposite occurs in volcanic lulls:

“In other words, during periods of strong volcanism and reflection of solar radiation back to space, the cooling, over land, would be more intense. This in turn would cause colder, drier air to blow out over the warm ocean. As a result, ocean cooling would be more

rapid, and the amount of moisture evaporated into the air would be higher. Consequently, the ice sheet would grow rapidly, with higher volcanism. Conversely, they [the ice sheets] would develop more slowly, or even melt back at the margins, during volcanic lulls.”³³

In the Creation/Flood/Ice Age model, the annual layer thickness before compression could have roughly been around 4–6 m/yr on Greenland (see part 1).² The D-O events are spaced about 50 m apart, which would be on a decadal timescale in the biblical model. On Antarctica, the 7–9 AIMs would have formed by the same volcanic mechanism over an interval of 1,200 m for an average of about 150 m per oscillation. This is also on a roughly decadal timescale with an accumulation rate of about 10 m/yr (see part 3).¹ The differences in the ‘abrupt changes’ between ice cores on Greenland and Antarctica can be accounted for by differences in volcanism between the Northern and Southern Hemisphere.³⁴

Volcanic events also increase the wind and dust, which add iron to the upper layers of the ocean.¹ The wind and iron fertilization can cause lower atmospheric carbon dioxide, an increase in calcium and sodium, and a decrease in methane. Methane increases about 200 ppbv in ice cores during warm interstadials and decreases during cold stadials of the D-O oscillations.³⁵ Thus, the other variables that are correlated with changes in oxygen isotope ratios can also be explained by volcanism.

Secular scientists also suggest millennial-scale oscillations due to volcanism

Some secular scientists also propose that the D-O events could be caused by volcanism.³⁶ They correlated eight Tambora-sized eruptions to the D-O stadials. Baldini and others later suggested that the YD cold event was caused by the Laacher See volcanic eruption in Germany at about 12,800 BP.³⁷ However, Kletetschka *et al.* don’t think this eruption was significant; besides, they claimed it may have erupted before the YD. This belief presupposes that the timescales for the ice cores and other climate data sets are precise, but this is dubious.

Others have suggested positive feedback mechanisms, such as increasing sea ice, reinforced the volcanism to cause uniformitarian millennial scale cooling.³⁸ However, there was no global cooling shown in the ice cores after several other large eruptions.³⁶ Other researchers discovered that volcanic ash layers in the Siple Dome ice core on Antarctica correlated with the onset of the millennial scale cooling recorded in the Greenland ice cores.³⁹

It is difficult to understand how volcanism could cause temperature changes that last one or two millennia. It makes more sense that volcanism can cause temperature changes on a scale of a few years to tens of years, as inferred historically and predicted by the Creation/Flood/Ice Age model. It

is known that if an eruption reaches high in the stratosphere, the climatic cooling can last a decade: “Our simulations demonstrate that the lifetime of stratospheric aerosol from extratropical injections is strongly connected to the injection height within the stratosphere.”³⁴ Also, two or more volcanoes erupting in close succession can also cause decadal scale cooling: “Clustering of major eruptions may even represent a substantial climate forcing over decades to multi-centennial timescales.”⁴⁰ Decadal changes caused by differential volcanism make much better sense than millennial scale changes. Decadal differential volcanism also implies that the secular dating of the ice cores is greatly stretched out.

How are the millennial scale oscillations explained in the East Antarctic ice cores?

Different amounts of volcanism in each hemisphere would cause the D-O events and the AIMs to be different.³⁴ Since the latitude of volcanism greatly affects the subsequent global cooling, fewer large eruptions in the Southern Hemisphere may be the cause of fewer, unimpressive AIMs compared to the Northern Hemisphere D-O events. For instance, a simulation of a Northern Hemisphere eruption, “generates an aerosol plume that is strictly confined to the Northern Hemisphere in the months following the eruption, with no direct radiative forcing on the tropical zone.”⁴¹ And, of course, the millennial scale isotope oscillations would be correlated with the many other chemical and gas variables in the ice cores. Wunsch states: “At higher frequencies, in the millennial band, there is no measurable average relationship between the records [of the hemispheres] and they appear to represent different processes, with a regional character.”⁴² I believe he is correct, since volcanism in one hemisphere can be nearly independent from the other hemisphere.

Abrupt climate changes used in the global warming scare

The fluctuations of the bottom few hundred metres of some of the deep Greenland ice cores really are ice-flow disturbances.^{43,44} But the oxygen isotope ratios near the bottom do point to warmer temperatures, which secular scientists associate with a warmer interglacial. This caused secular scientists to think about the present interglacial, the Holocene. If the previous interglacial can have abrupt climate changes, then so too can the Holocene, and therefore, abrupt climate changes are possible today. However, these bottom fluctuations are due to ice deformation.

The scientists suggest that a D-O type temperature excursion could be caused by a temperature change passing some ‘threshold’ resulting in an abrupt climate change to a new stable climate state. The new climate state may be radically colder or warmer.

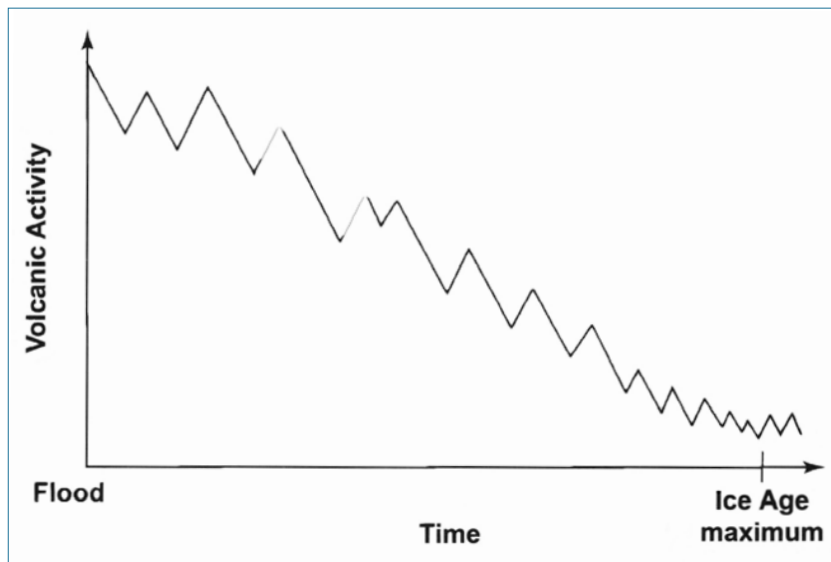


Figure 3. Postulated Ice Age volcanism with peaks and lulls in general decreasing activity with time to glacial maximum⁴⁹

Some scientists have even suggested that global warming may just be the ‘trigger’, and once we cross a certain warming threshold, a catastrophic climate change would occur, like seen in Greenland ice cores. This is one reason why so many scientists and layman alike are extremely concerned about global warming. Kendrick Taylor states: “It is ironic that greenhouse warming may lead to rapid cooling in eastern North America, Europe and Scandinavia.”⁴⁵ Because the ‘next’ ice age is due soon, others threaten: “But warming could lead, paradoxically, to drastic cooling—a catastrophe that could threaten the survival of civilization.”⁴⁶ So, these abrupt climate changes have fuelled the global warming scare.

Abrupt climate changes will not occur today

Since these abrupt climate changes occurred just during the Ice Age due to highs and lows in volcanism, abrupt climate changes caused by global warming or some other mechanism are unlikely to occur today.⁴⁷ The ice that accumulated after the Ice Age from the tops of the cores from both Antarctica and Greenland show that there have been no significant climate changes since the Ice Age. There have been minor climate fluctuations, however. Wunsch states: “Connection of D-O events to the possibility of modern abrupt climate change rests on a very weak chain of assumptions.”⁴⁸

Conclusions

Abrupt climate changes, attributed to inferred temperatures from the Greenland ice cores, are real. The estimated temperature change from oxygen isotope ratios may even

underestimate the change in temperature. As expected, uniformitarian scientists are stumped. Then when we examine millennial-scale changes in the Antarctic ice cores, AIMs, we find a much different signal. The AIMs are much weaker than the D-O events in the Greenland ice cores. They represent a temperature change of about 2°C that changes slowly and is opposite to the change in Greenland ice cores. This does not stop glaciologists correlating the changes, although little or no correlation probably exists. This has given rise to the bipolar see-saw theory and the most popular cause for the anticorrelation is the AMOC, although the adequacy of this theory is questionable. Just like with the large deuterium isotope oscillations in the lower 1,500 m of the East Antarctic ice cores,

‘millennial scale oscillations’ can be explained as climate changes caused by decadal scale oscillations in volcanism in the Creation/Flood/Ice Age model. The fluctuations of other variables, such as CO₂, calcium, and sodium, can also be explained by this mechanism. This difference between hemispheres can be explained by different volcanic scenarios between the hemispheres, which would generally be semi-independent from each other. The paradigm shift in glaciology to abrupt climate changes has fuelled the global warming scare. However, these abrupt changes occurred during the Ice Age portion of the ice cores and so do not apply to today.

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Ice core oscillations and abrupt climate changes: part 5—the early Holocene green Sahara

Michael J. Oard

The Sahara Desert is very hot and dry today, but during the Ice Age lakes and streams were abundant in now dry areas across the earth around 30°N and 30°S. The southwest United States is semi-arid today, but during the Ice Age there were numerous large lakes, even in Death Valley. These lakes were associated with the Ice Age, since shorelines from the pluvial lakes etched end moraines in some locations. Abundant evidence shows that the Sahara Desert was also well-watered, and not that long ago. Numerous carbon-14 dates, which creation scientists can generally use in a relative sense, show that the wettest time, the African Humid Period (AHP), was after the Ice Age. Uniformitarian scientists do not know the cause of the AHP. But with glacial maximum at about 1,000 years after the Flood in Antarctica and the surrounding ocean, the Intertropical Convergence Zone (ITCZ) could easily be pushed more than 600 km farther north than it averages today, causing the green Sahara.

The Sahara Desert of northern Africa is one of the driest and hottest locations on Earth (figure 1). It rains in the eastern Sahara once every 30–50 years. The Sahara Desert covers about 9,200,000 km² and is comparable to the size of the United States. It is divided into several regions by high mountain ranges, such as the Ahaggar and Tibesti Mountains (figure 2). Some 74% of the Sahara is covered by sand with several large ‘sand seas’, such as the Great Sand Sea of eastern Libya and western Egypt, which covers 72,000 km² (figure 3). Not counting the Atlas Mountains of northwest Africa, the highest peak in the Sahara Desert is Emi Koussi, in the Tibesti Mountains. Its elevation is 3,445 m. The mountainous areas of the Sahara have oases with playa lakes. Playa lakes are generally dry and free of vegetation. If precipitation is high enough, they occasionally have water.

South of the desert is an east–west belt called the Sahel. It is a semi-arid tropical savanna, which alternates between wet and dry cycles depending upon to the exact location of the Intertropical Convergence Zone (ITCZ). A massive drought that occurred from the late 1960s to the early 1980s killed 100,000 people and left 750,000 people depending on foreign food aid (out of a population of about 50 million people).

South of the savanna is central Africa, where tropical rain forests flourish due to the presence of the ITCZ. The ITCZ is formed by the general circulation of the atmosphere in which air sinking at 30° south and north, where deserts and semi-arid areas are located today, hits the surface or surface layer. The air in this layer is forced to spread toward the pole and toward the equator. The air spreading to the equator from around 30°N and from 30°S converges near the equator, forcing the air to rise (figure 4). Rising air is the cause of practically all precipitation. So, this rising air near the equator becomes a rain belt. Precipitation is about 1.7 m per year.

Present arid and semi-arid areas well-watered during the Ice Age

Both creation and secular geologists agree that the earth’s deserts and semi-arid areas were once well-watered,^{1,2} for instance in the Southwest US (figure 5). Creation scientists attribute the early filling of these lakes to the ponding of water in enclosed basins during the runoff stage of the Flood. The lakes grew and were sustained by Ice Age precipitation along with a network of rivers and streams. During this time the Great Salt Lake in Utah, USA, on average 3.7 m deep today, was about 12 times its current area and about 325 m deep.³ Measuring ancient shorelines in Death Valley, California, USA, shows a lake once filled Death Valley 180 m deep (figure 6).³ Today Death Valley is one of the hottest, driest places on Earth with the world record high temperature.⁴

We know that these lakes were associated with the Ice Age, since shorelines of ancient Lake Russell cut through an end moraine from a valley glacier descending from the eastern Sierra Nevada Mountains (figure 7).⁵ Lake Russell was 242 m deeper than the 1975 level of Mono Lake, a salt lake in the Bishop Valley of east-central California. Because this end moraine was not deformed after the shorelines were carved, the ice must have been melting at the time the shorelines were carved.

The Sahara Desert was also well watered

As hard as it is to believe, the Sahara Desert also was once well watered. Field research and satellite pictures suggest evidence of lakes and rivers, now mostly buried beneath the sand.^{5–7} Paleolake Chad was much larger than Lake Chad today, covering an area of 340,000 km².⁸ However, some

researchers suggest that there were no large lakes other than Paleolake Chad, but instead wetlands and small lakes. This suggests that the wet Sahara may not have been as wet as some suppose.⁹ Regardless, this period has been called the African Humid Period (AHP).

Natives, archaeologists, and collectors have found countless artifacts from the Ice Age and fossils of elephants, giraffes, buffaloes, antelopes, rhinoceroses, and other animals. Even aquatic animals, such as the hippopotamus, astonish collectors.¹⁰ This is the kind of diversity seen today in the African Serengeti. Dwarf Nile River crocodiles have been found as recently as the early 20th century in isolated lakes or pools in oases of the high western Sahara,^{11,12} which indicates that the Sahara was wet not that long ago.

Judging by the thousands of rock petroglyphs (figure 8), the population of the Sahara was quite large. James Wellard states:

“The Sahara is a veritable art gallery of prehistoric paintings. ... The evidence is enough to show that the Sahara was one of the well-populated areas of the prehistoric world. ... Yet there is this work, in the most inaccessible corners of the desert, literally thousands of figures of tropical and aquatic animals, enormous herds of cattle, hunters armed with bows and boomerangs, and even ‘domestic’ scenes of women and children and the circular huts in which they lived.”¹³

Others corroborate:

“Occupation is clearly testified in the frequent rock engravings that are scattered throughout the upland regions of the desert, illustrating a lush environment with Sahelian and riverine fauna and scenes of large-game hunting, livestock herding and religious ceremony.”¹⁴

The wettest period was after the Northern Hemisphere Ice Age

The timing of the AHP has been debated, but scientists generally believe it started about 15,000 BP, which is during deglaciation in their ‘last’ ice age.^{15,16} Before that date, the data become sketchy and were based on questionable uniformitarian dating systems. As far as they know, the period of greatest wetness is actually believed to have come *after*

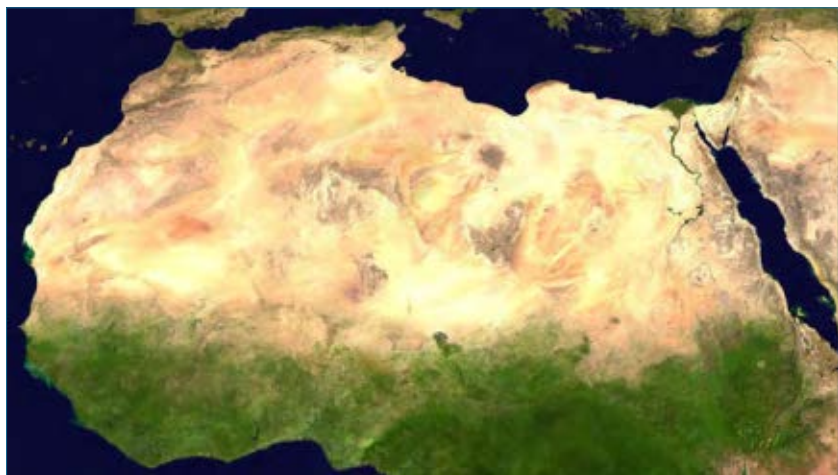


Image courtesy of NASA

Figure 1. Satellite view of the Sahara Desert in North Africa with the tropical rain forest in central Africa



Image: T. L. Miles/CC BY-SA 3.0

Figure 2. Map showing major dune seas (ergs) and mountain ranges of the Sahara. Red dashed line shows approximate limit of the Sahara. National borders in grey. Dune seas in yellow.



Image: Roland Unger/CC BY-SA 3.0

Figure 3. Dunes of the Great Sand Sea near Siwa, Egypt

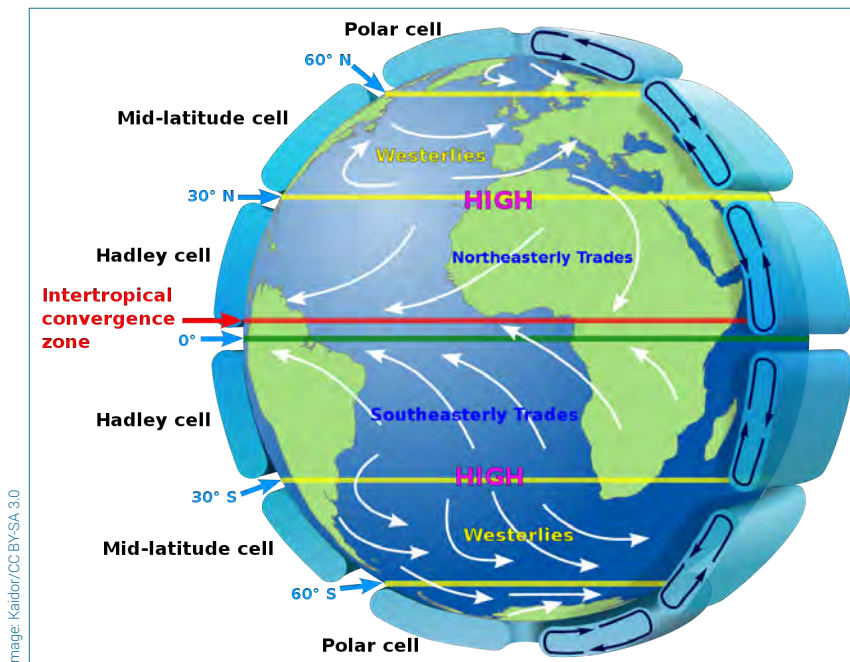


Figure 4. Global general circulation of Earth's atmosphere displaying the Hadley cell (equator to about 30°), Ferrell cell (about 30° to 60°), and the polar cell (about 60° to the pole)



Figure 5. Ice Age lakes in the western United States, including glacial Lake Missoula in western Montana. The red arrows show the path of the Bonneville flood and the later Lake Missoula flood.

the Ice Age.^{15,16} Based on 3,287 carbon-14 dates from 1,011 human archaeological sites, man was in northern Africa after the Ice Age, 10,500–5,500 years ago, according to the uniformitarian timescale. Taking carbon-14 in a *relative* sense,

these dates correspond to deglaciation and the early- to mid-Holocene, after the Ice Age. This seems to conflict with the timeline of other wet areas, which are now semi-arid areas or deserts, which developed during the Ice Age.

Uniformitarian scientists stumped

Secular scientists really do not know why the AHP occurred. It is assumed that the ITCZ moved north. It would have to have moved 1,600 km or more for the Sahara to be a tropical rainforest, like in central Africa near the equator. It is more likely that it moved north significantly less, but this would have depended upon how wet the Sahara actually was. There is some debate on the degree of wetness. Maybe it was as wet as, or a little wetter than, the Sahel today. This would mean the northward shift of the ITCZ was more like 600 km or a little more than the average location today. This represents a northward movement of the ITCZ at least 5° but up to as much as 15° latitude northward. The ITCZ is related to the current general circulation of the atmosphere (figure 4), and scientists do not know how or why it could be decoupled from the general circulation and moved farther north during the AHP.^{17,18}

Some climate simulations claim modest success in moving the ITCZ a little farther northward due to Milankovitch fluctuations and the increase in greenhouse gases.¹⁵ One wonders how slight changes in the earth's radiation balance caused by the Milankovitch mechanism¹⁹ and an increase in carbon dioxide after the Ice Age would produce an ITCZ significantly farther north than it is today. Carbon dioxide is significantly higher today than it was immediately after the Ice Age, and it was about 100 ppm lower before the industrial revolution, and the ITCZ was little affected.

Thus, uniformitarian scientists have great difficulty explaining the green Sahara, as well as 'wet' deserts everywhere. Their Ice Age models end up with a very cold and drier climate than we have today.²⁰ The most significant

problem uniformitarian scientists face is how to reconcile this principle that the colder the air, the less moisture it can hold. An Ice Age requires abundant precipitation.^{1,21}

Uniformitarian scientists need precipitation not only to cause an ice age but also to find a way to fill the pluvial Ice Age lakes. They hope to find some combination of cooler temperatures which results in less evaporation, and yet adds greater precipitation. The following calculations further elucidate their challenge. For the southwest United States, a cooling of 10°C would reduce the evaporation by about 50%.²² But the runoff would need to be 2–10 times the current runoff for a long period of time to fill these lakes—a very difficult scenario. Ibarra *et al.* conclude for the Southwest United States:

“The late Pleistocene landscape of the western United States was characterized by vast lake systems indicative of a hydrological balance dramatically different from the present In addition, the precise connection between lake levels and climate factors has proven challenging to establish, because the relationships among the physical and hydrologic controls on measured variables and past climatic studies are unresolved.”²³

The evaporation rate in Australian Lake Eyre today is 240–360 cm/yr. Evaporation would have to fall to an unrealistic low of 50 cm/yr with a constant inflow of 6,000 m³/sec over many years to maintain mega-Lake Eyre.²⁴ This seems very unlikely.

Glacial maximum Southern Hemisphere about 1,000 years after the Flood

I believe the cause of the African Humid Period is that the Ice Age lasted longer in the Southern Hemisphere than the Northern Hemisphere. I believe that glacial maximum was reached about 1,000 years after the Flood in Antarctica and the surrounding ocean because the Antarctica Ice Sheet continued to grow. The large rise in deuterium isotope oscillations in the Antarctic ice cores and the similar large rise in the Greenland ice cores are correlated and were likely caused by the melting of the ice sheets, except Greenland, in the northern hemispheres. The ice caps over South America, Tasmania, and New Zealand decreased at this time.

The Antarctic ice sheet did not grow upward much after 500 years, but it pushed farther out onto the continental shelf



Figure 6. Shorelines from pluvial Lake Manly in southern Death Valley, California, USA



Figure 7. Pluvial Lake Russell shorelines about 213 m above shrivelled up Mono Lake (arrow pointing to the shoreline) in the Owens Valley, California, USA

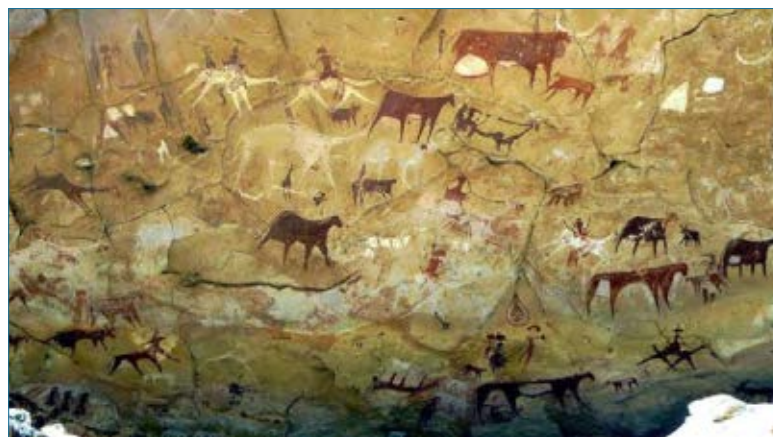


Figure 8. Prehistoric rock paintings from Manda Guéli Cave in the Ennedi Mountains, Chad, Central Africa. Camels have been painted over earlier images of cattle, perhaps reflecting climatic change.

Image: David Stanley/CC BY 2.0

and thickened in the coastal area. Sea ice would have formed each winter farther north. Figures 9 and 10 show the area of ice after 750 and 1,000 years, respectively. So, post-Ice Age accumulation on the top of the Vostok and Dome C ice cores was 300 m and 400 m, respectively, in 4,000 years. This represents an average post-Ice Age accumulation of 7.5 cm and 10 cm/yr, respectively. More accumulation occurs at Dome C, likely because it is closer to the ocean than Vostok. These values compare with the uniformitarian estimate today of about 5 cm/yr. However, 5 cm/yr likely assumes that the

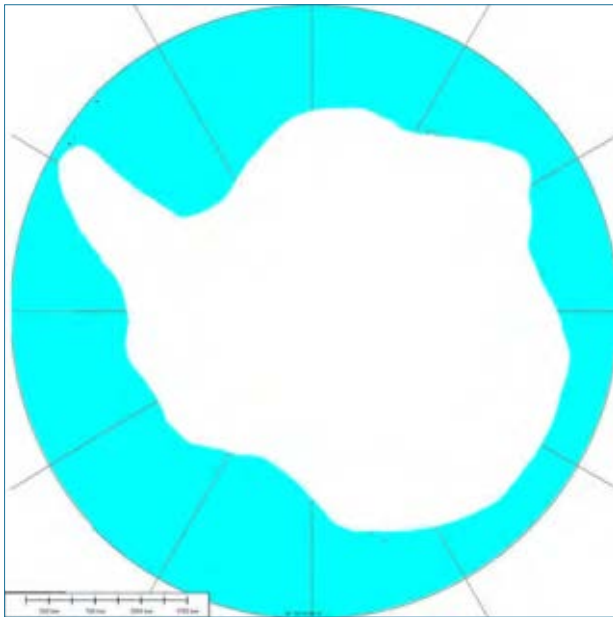


Figure 9. Postulated snow and ice after 750 years on Antarctica (drawn by Melanie Richard)

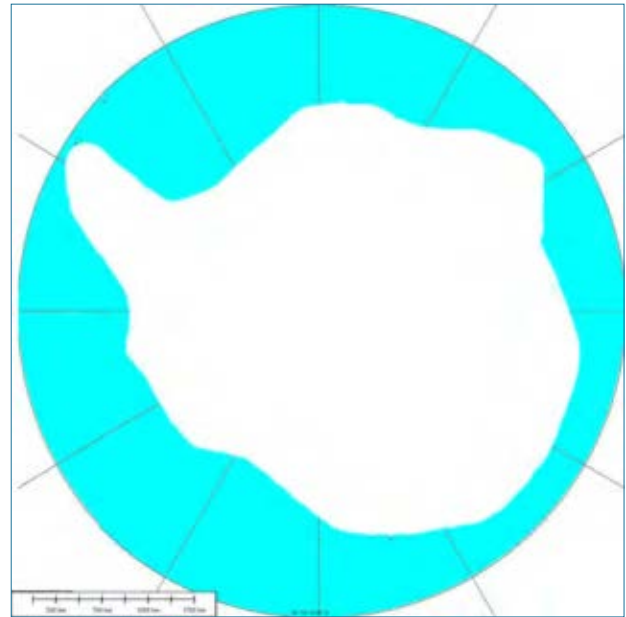


Figure 10. Postulated snow and ice after 1,000 years on Antarctica (drawn by Melanie Richard)

Holocene was about 10,000 years long. It is unlikely that scientists can accurately measure the annual average, since the snow blows around so much.

The later glacial maximum of 1,000 years after the Flood in the Southern Hemisphere resulted from the differences in the land/ocean distribution between hemispheres. With a larger supply of warm water in the Southern Hemisphere, the southern oceans took longer to cool. Ice continued to build up in the coastal areas with little accumulation at inland locations. Sea ice kept spreading farther northward until glacial maximum.

During Antarctic deglaciation the ice likely mostly retreated from the continental shelf to near the coast, with the thickness of the ice close to the coast decreasing to about today's values (figure 11). Nunataks, mountains that stick above the ice, show glaciation was a few hundred metres higher than today at glacial maximum. The ice was 1,000 m thicker at some locations on the Antarctic Peninsula and Dronning Maud Land of East Antarctic at glacial maximum.²⁵

A later glacial maximum causes the green Sahara

How does this explain the green Sahara? It is known the precipitation for the AHP came from the ITCZ because the oxygen isotope ratios in the water were high.²⁶ The higher the oxygen isotope ratio, the warmer the temperatures, all other variables remaining the same. It is also known that the ITCZ migrates seasonally away from the winter hemisphere and toward the summer hemisphere.^{27,28} The seasonal range of the ITCZ today is about 12° latitude,²⁹ from 5.3°S to 7.2°N today.³⁰ Therefore, after the Ice Age ends in the Northern Hemisphere in about 700 years, the Ice Age in the Southern

Hemisphere would last another 300 years and push the ITCZ farther north toward the warmer Northern Hemisphere than occurs today due to the seasons. Such a condition could push the ITCZ more than 600 km (375 mi) north into the Sahel or even the Sahara Desert and cause the green Sahara.

The timing of the AHP was not half the Holocene, as claimed by uniformitarian scientists, because the ¹⁴C dates can be compressed between the Flood, 4,500 years ago,³¹ and about 3,000 years ago. From 3,000 years ago to the present, the ¹⁴C dates measured by uniformitarian scientists would also correspond to the same time in biblical Earth history. Thus, ¹⁴C dates from 50,000, the practical limit of the method, and 3,000 years ago can be telescoped to between 4,500 and 3,000 years ago in the biblical timescale. Higher cosmic rays, decreasing exponentially, during the Ice Age may explain why.³²

Conclusions

The Sahara Desert was once well watered, hosting numerous aquatic animals and man. Based on thousands of carbon-14 dates, the AHP occurred mostly after the Ice Age, unlike other pluvial periods in now semi-arid and arid locations that occurred during the Ice Age. Uniformitarian scientists are stumped, and their climate simulations are no help. In the Creation/Flood/Ice Age model, the AHP can be explained by maximum glaciation in Antarctica being about 1,000 years after the Flood. So, after the Northern Hemisphere glaciation ended, the continuing Ice Age on Antarctica and the surrounding ocean would likely push the ITCZ significantly farther northward than its average today. The result would be more rain over the Sahara Desert.

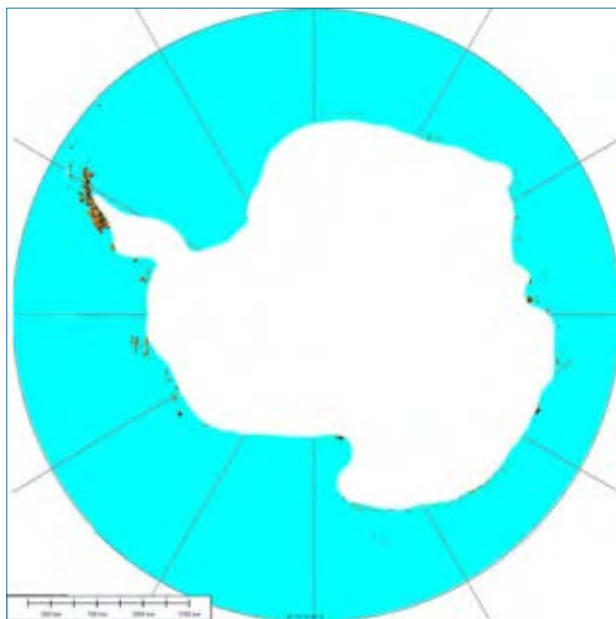


Figure 11. Area of snow and ice on Antarctica today (drawn by Melanie Richard)

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Created kinds vs Ark kinds—implications for creation research

Jean K. Lightner

The science of baraminology is based on the understanding that the biblical phrase appearing in the creation account (and in later texts) “according to their kinds”, conveys important information for an accurate understanding of natural history. Baraminologists attempt to identify which creatures are related, in that they descended from the same created kind. This information can then be used to infer other historical details within the creation model. This includes details from genetics, such as genomic variability at the time of the Flood, to geology and paleontology, such as the Flood/post-Flood boundary. A key issue is understanding if the kinds mentioned in the Genesis 1 creation account are identical to those mentioned in Genesis 6 and 7 in the Flood account. Here a review of the underlying Hebrew word translated ‘kind’ suggests that they are not necessarily identical, and caution should be used in inferences made about the kinds of animals on Noah’s Ark.

Baraminology is the study of created kinds. The term is derived from two Hebrew words: *bārā*’—(he) created and *mîn*—kind. In this system of study, an entire baramin (holobaramin) is considered to be the originally created members of one kind plus all of their descendants. If a group of plants or animals today are determined to be quite similar based on the ability to hybridize or other multiple measures that show significant, holistic continuity, then they are considered to belong to the same baramin.¹ Thus, the word baramin has strong taxonomic implications.

As scientists, it is easy to see things in taxonomic terms. Yet, studies on the Hebrew word *mîn* as it is used in various biblical passages have repeatedly warned that the word is unlikely to carry the taxonomic significance that the word ‘baramin’ implies. Williams did an analysis of *mîn*, considering its use in the Old Testament, later Hebrew writings, and translations; he also considered the etymology of the word.² He suggests the word is likely of biological origin, and has a basic meaning of ‘division’. This seems to support creationist ideas of biological taxonomy involving major discontinuity (between baramins), but he points out where caution is warranted.

Over a decade later Turner revisited the topic, again attempting to address the significance of *mîn* in Scripture as it relates to the interests of creation biologists.³ He has many similar conclusions, namely that in Scripture *mîn* plausibly refers to biological subdivisions, and that it most likely refers to “a general, observable category—a lot like the English, ‘kind’ [emphasis in original]!”⁴ Both Williams and Turner should be read in their entirety by anyone interested in the subject.

In this paper we want to build on these foundational works and ask some deeper questions. We want to know if the kinds of terrestrial and flying creatures created in Genesis 1 were the same as those taken on the Ark during the

Flood. To do this, it is useful to review how *mîn* is used in Scripture, revisiting some points that have been previously made. We also need to examine what is known from biology, to see what may be helpful in understanding the scriptural patterns. Finally, we will be able to address the question: Were the created kinds of Genesis 1 the same as those at the Flood (Genesis 6–9)? And how should this affect creationist interpretations of scientific evidence?

The basic pattern

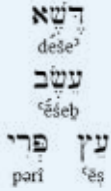

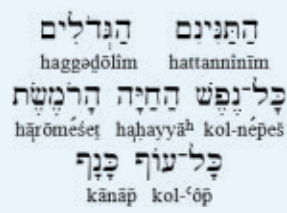
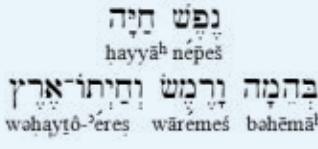

Hebrew *mîn* is found in several different parts of Scripture: the creation account (Genesis 1; 10 times); the Flood account (Genesis 6–8; seven times); the unclean/clean animal lists (Leviticus 11 and Deuteronomy 14; 13 times), and in Ezekiel (47:10; once).

Each time *mîn* appears, it has a lamed prefix.⁵ This lamed prefix is the most common preposition used in Scripture, and it is always attached in front of its noun. When attached to the noun *mîn* in the book of Genesis, it is most commonly translated as ‘according to’.⁶ Additionally, *mîn* always occurs with a pronominal suffix referring back to the original noun (sea creatures, flyers, etc.) this phrase modifies.⁷ This is generally rendered ‘its’ or ‘their’ depending on if it is singular or plural. Thus, *mîn* with its associated affixes is often translated “according to its/their kind(s)”.

The creation account

The Hebrew ‘lamed + *mîn* + pronominal suffix’ is used ten times in Genesis 1 and is applied to plants and animals (table 1). In the first three uses it is applied to vegetation, seed-bearing plants and trees (Genesis 1:11–12). It should be noted that the Hebrew word for seed has a broad semantic

Table 1. A list of the verses in Genesis 1 where the Hebrew word *mîn* appears. The text in the English Standard Version (ESV) is on the left with the translation of the "lamed + *mîn* + pronominal suffix" underlined, and the group it refers to in italics. The Hebrew word/phrase corresponding to the italicized text is in the centre column, and some interesting patterns are noted in the right column.

<p>And God said, "Let the earth sprout <i>vegetation, plants</i> yielding seed, and <i>fruit trees</i> bearing fruit in which is their seed, each <u>according to its kind</u>, on the earth." And it was so.</p> <p>Genesis 1:11 ESV</p>		<p>Although the underlined phrase follows fruit trees, it would seem it likely refers to all vegetation, with plants and trees being two broad categories of vegetation.</p>
<p>The earth brought forth vegetation, <i>plants</i> yielding seed <u>according to their own kinds</u>, and <i>trees</i> bearing fruit in which is their seed, each <u>according to its kind</u>. And God saw that it was good.</p> <p>Genesis 1:12 ESV</p>		<p>Here the underlined phrases refer to plants and trees, respectively; though worded slightly differently, it is clearly referring to the same thing as the previous verse.</p>
<p>So God created <i>the great sea creatures</i> and <i>every living creature that moves</i>, with which the waters swarm, <u>according to their kinds</u>, and <i>every winged bird</i> <u>according to its kind</u>. And God saw that it was good.</p> <p>Genesis 1:21 ESV</p>		<p>Day 5 is unusual in that the underlined phrase does not appear in verse 20 where God speaks. Also, the groups mentioned in v. 20 are expanded here to include great sea creatures, probably to emphasize that God is the Creator of (and far more powerful than) these terrifying beasts (cf. Job 40–41).</p>
<p>And God said, "Let the earth bring forth <i>living creatures</i> <u>according to their kinds</u> — <i>livestock and creeping things and beasts of the earth</i> <u>according to their kinds</u>." And it was so.</p> <p>Genesis 1:24 ESV</p>		<p>"Living creatures" is repeated here, this time referring to those that are on the land (cf. v. 21); three broad categories of terrestrial living creatures are given.</p>
<p>And God made the <i>beasts of the earth</i> <u>according to their kinds</u> and <i>the livestock</i> <u>according to their kinds</u>, and <i>everything that creeps on the ground</i> <u>according to its kind</u>. And God saw that it was good.</p> <p>Genesis 1:25 ESV</p>		<p>The same three categories from the previous verse are listed in a different order and with slight variation in modifiers (e.g. creeping things vs everything that creeps on the ground).</p>

range and would include plants that reproduce by what botanists refer to as spores.⁸

The next two uses occur when God created the "great creatures of the sea and every living and moving thing with which the water teems" and "every winged bird" (Genesis 1:21 NIV).⁹ As with the plants, these were created "according to their kinds/its kind". The final five uses are applied to 'living creatures' created on the sixth day and three subgroups of them, often translated as livestock, wild animals, and creatures that move (or creep) along the ground (Genesis 1:24–25).¹⁰

It is significant to note that after the above creatures have been created 'according to its/their kind(s)', humans

are then created in the image of God. Humans are not created according to their kind; they are unique. Each time the term 'according to its/their kind(s)' occurs, it is believed to convey the idea that there were two or more groups that comprised the broad category mentioned. So, we have two or more 'kinds' of plants and trees; two or more 'kinds' of aquatic life; two or more 'kinds' of birds (or more correctly: flying creatures), etc. This type of division was not created in humans (Acts 17:26).¹¹

In the Hebrew text, the broad groups are not always repeated verbatim (table 1). This is consistent with how ordinary language is used; there are several ways one can word

Table 2. The two verses in the Flood account where the Hebrew word *mîn* appears. The text in the English Standard Version (ESV) is on the left with the translation of the “lamed + *mîn* + pronominal suffix” underlined, and the group it refers to in italics. The Hebrew word/phrase corresponding to the italicized text is in the centre column, and some interesting patterns are noted in the right column.

<p>Of <i>the birds</i> according to their kinds, and of <i>the animals</i> according to their kinds, of every <i>creeping thing of the ground</i>, according to its kind, two of every sort shall come in to you to keep them alive.</p> <p>Genesis 6:20 ESV</p>	<p>הָעוֹף hā'ōp הַבְּהֵמָה habbēhēmāh כָּל־רֶמֶשׂ הָאָדָמָה kol-hā'ādāmāh rēmeš kōl</p>	<p>Only two of the three groups created on Day 6 (Genesis 1:24, 25) are mentioned here, along with the flying creatures of Day 5. This expansion/contraction of major groups is common (cf. Genesis 1:20 and 21; 26 and 28) in ordinary language.</p>
<p>they and every <i>beast</i>, according to its kind, and <i>all the livestock</i> according to their kinds, and every <i>creeping thing</i> that creeps on the earth, according to its kind, and every bird, according to its kind, every winged creature.</p> <p>Genesis 7:14 ESV</p>	<p>כָּל־הַחַיָּה kol-hāhayyāh כָּל־הַבְּהֵמָה kol-habbēhēmāh כָּל־רֶמֶשׂ kol-hāremēš כָּל־הָעוֹף kol-hā'ōp</p>	<p>Here all the <i>hayyā^h</i> are mentioned. This word, used in conjunction with <i>nēpeš</i>, referred to all living terrestrial creatures (Genesis 1:24), and in construct with <i>hā'āreš</i> (Genesis 1:25) referred to a broad group of land animals. The variation in wording makes it evident these are not taxonomic terms. As is typical of ordinary language, one can convey the same idea clearly using words in different ways.</p>

things to convey the same meaning.¹² The narrative provides the context for understanding what is being communicated.

The Flood narrative

There is tremendous similarity between how animals are described in Genesis 1, and how they are described during the Flood account (table 2). Hebrew ‘lamed + *mîn* + pronominal suffix’ is used seven times in the Flood narrative. In Genesis 6:20 (NIV) it refers to ‘birds’ (or more accurately, flying creatures), ‘animals’ (from the Hebrew word translated livestock in Genesis 1:24, 25; 7:14), and everything that “moves along the ground”. In Genesis 7:14, the same basic groups, with minor differences in modifiers, are mentioned along with “every beast” (cf. Genesis 1:25).

As alluded to previously, the variation in the large general groups that are created or preserved ‘according to their kinds’ should not be troubling when one considers this was written in a natural language, not as a book on taxonomy. In any language a specific word can have a range of meanings. For example, in English the word ‘animal’ can be used in several slightly different ways. It may refer to anything in the animal kingdom (Animalia); this would include humans, dogs, fish and birds. It may be used of animals as distinct from humans, as in the phrase ‘man and animals’. It may distinguish between terrestrial animals and other animals, as in ‘animals and birds’ or ‘animals, fish, and birds’. In each case, an English speaker can tell from the context what is being discussed. Many of the terms used in Genesis 1, 6, and 7 have similar flexibility. Rather than try to overly dissect

the meaning of each individual word, it is important to read the words in the natural flow of the narrative.

Despite the minor variation in the larger groups identified, the ‘lamed + *mîn* + pronominal suffix’ seems to be conveying the same idea: there are two or more subdivisions in each general group mentioned. We are not told how many, and the text does not help us discern if it was two, or more than a thousand. Yet these ‘kinds’ were identifiable to the people of that time. There does seem to be considerable similarity between the kinds at creation and those at the Flood. Were they identical? In other words, was every created terrestrial and flying kind represented by exactly two individuals, or seven (pairs?) for the clean animals, on the Ark? Before exploring that question, it is worth examining two things. What do we know from observations of creatures today, and how is ‘lamed + *mîn* + pronominal suffix’ used in the rest of the Pentateuch?

Observations of God's creatures

Plants and animals, as we observe them today, are not comprised of static species with invariant traits. Rather, they can change over time in certain ways.¹³ New variation can arise, as is well documented in domestic plants and animals. One only needs to look at breeds of livestock, or varieties of garden plants, to see variety that has arisen under domestication.¹⁴ In domestic species we do not generally identify new breeds or cultivars as separate species, despite some profound phenotypic differences.¹⁵



Figure 1. Threespine stickleback (*Gasterosteus aculeatus*) fish that live in the ocean have pelvic spines and body armour, but they breed in brackish or fresh water. When they get trapped in a freshwater environment, the population will progress through a series of changes where the spines and body armour are lost. These dramatic changes in phenotype, once thought to take thousands of years, have been documented to occur within decades (see references 17 and 18).



Figure 2. The relative limb length in anole lizards differs depending on the diameter of the vegetation they typically move on. When a male and female brown anole lizard (*Anolis sagrei*) adapted to wide vegetation were moved to form a new population on each of seven islands with only narrow vegetation, the average limb length of their descendants decreased rapidly over the course of just three years (see reference 22).

Variation occurs in wild animals as well. For example, in the well-studied threespine stickleback fish (*Gasterosteus aculeatus*), those that live in the ocean have pelvic spines and body armour that protect them from predators encountered in the marine environment. However, those that inhabit freshwater habitats have lost these traits, which appears to be adaptive in avoiding different predators (figure 1). The loss of pelvic spines is controlled by a deletion in a regulatory region for the *pitx* gene. The remaining regulatory regions for this gene are maintained, which preserves *pitx* expression in other tissues where it is essential. Since the deletions are not identical across different freshwater populations, they are reasonably inferred to have occurred separately.¹⁶

It had been assumed that these changes take thousands of years, based on the neo-Darwinian idea that change is slow and gradual. However, these changes have been documented to occur rapidly, within decades.^{17,18} This suggests that designed pathways are involved. Moreover, the regulatory

region affecting pelvic spines has stretches of thymine-guanine (TG) repeats that make the region unstable. The intact region present in marine sticklebacks was shown to form alternative DNA structures, dramatically increasing the rate of double-stranded breaks and deletions.¹⁹ This design feature is consistent with an omniscient Creator, who created life to be able to reproduce and fill the earth.

Rapid changes have also been observed in many other vertebrates. For example, when lizards have been introduced to a new island, rapid phenotypic changes have been documented (figure 2). These changes include: 1) alteration in head size and shape, associated in at least one case with changes in the gut, to adapt to a different diet;^{20,21} 2) changes in hind limb length to adapt to locomotion on vegetation of a different diameter;²² and 3) increase in relative toe pad size after exposure to hurricanes.²³

Studies of birds on islands have revealed interesting information on rapid changes, as well. Peter and Rosemary Grant studied finches on Daphne Island in the Galapagos, documenting changes in the size and shape of finch beaks (figure 3). These changes were influenced by migration, hybridization, and severe droughts.²⁴ During their 40-year study, they observed a new species arise.²⁵ Other studies in island birds provide evidence that adaptive changes in plumage and structure can be so dramatic that they confuse taxonomists attempting to classify them.²⁶

How much time?

It is important to recognize that under certain situations organisms can diversify far more rapidly than scientists used to believe. Explaining the diversity of life in a creation model is not difficult when tied to this observationally based evidence.²⁷ These profound changes that are documented to occur within decades in the wild populations described above, or centuries in the case of plant and animal breeding, should be compared to the chronology of Scripture.

Based on the genealogies in Genesis 5, the time from creation to the Flood is around 1,600 years. The estimates can vary a little depending on which textual tradition one relies on. Using the Septuagint, the estimate is over 2,000 years; while the Samaritan Pentateuch would have it closer to 1,300 years.²⁸ In any case, this is considerable time for diversification of plants and animals to occur. Several examples discussed in the previous section involved rapid changes in response to a new environment. This is a commonly observed pattern, as God designed His creatures to reproduce and fill the earth, because He intends the earth to be inhabited (Genesis 1:22, 28; Isaiah 45:18). If the creation narrative implies that life was created in one area and was to reproduce to fill new environmental niches, then diversification in the first few hundred years after creation should have been profound.

After the Flood, we know all land animals and flying creatures diversified from one location (Genesis 7:20–23; 8:17). Again, this is the type of circumstance where rapid adaptation and diversification tend to be observed. Of course, it is also possible that the environmental changes were too much for some organisms, and they died out; this is another observable outcome when the environment profoundly changes.

The time from the Flood to the Exodus was around 800 years. If the Septuagint or Samaritan Pentateuch are considered, it is well over 1,000 years. Fairly soon after the Exodus, the laws regarding clean and unclean animals were given. That is where we will turn our attention, next.

Unclean/clean lists in the Law

There is a noticeable difference in the categories modified by the ‘lamed + *mîn* + pronominal suffix’ in the lists of unclean and clean animals (table 3) compared to Genesis. Instead of broad groups of creatures, specific animals are named. For example, the raven, which is mentioned at the time of the Flood (Genesis 8:7), is listed in Leviticus 11:15 and Deuteronomy 14:14 ‘according to its kind’.

Some creationists are excited about the specific mention of different birds in these passages. They assume that the passage identifies baramins. So, the raven would be one baramin. However, this is ignoring the fact that this construction with the word *mîn* is viewed in Genesis as identifying two or more subgroups within the larger, named category. Thus, the passages would be indicating that there are multiple kinds of ravens when the Law was given.²⁹ This is consistent with how modern translations handle these passages. The prohibition is against eating ‘any kind of raven’, not any individual of the ‘raven baramin’.

If God had intended to give us taxonomic information here, it doesn’t make sense that *mîn* is still being used in the ‘lamed + *mîn* + pronominal suffix’ format. In Genesis, this construction is understood as meaning there are two or more ‘kinds’ in the group. If the word *mîn* had taxonomic significance, there should be some change in the prefix and/or suffix to indicate that we are now identifying the named category as a baramin. However, that is not what the text gives us. Thus, it seems clear that these passages do not hold promise for identifying baramins.

If these lists do not identify baramins, then what do they tell us? Clearly, at the time the Law was given, the birds and insects modified by ‘lamed + *mîn* + pronominal suffix’ had diversified enough that there were different kinds, in the common sense of the word. This could be what we today would recognize as different species, subspecies, or colour morphs. So, while we cannot identify baramins, we can say this suggests diversification within these named groups, since colloquial words to identify various flying creatures were already broad enough that variants were known.



Image: Mike's Birds/CC BY-SA 2.0

Figure 3. Peter and Rosemary Grant spent decades studying medium ground finches (*Geospiza fortis*) on Daphne Major Island. The beak size and shape varied within the population, but the average values changed over the course of the study due to migration, hybridization, and temporary loss of food sources during droughts.

Created kinds vs Ark kinds

It seems reasonable to infer that the kinds of Noah’s day were similar to those at creation, as the language is similar. I and other creationists often equate them.³⁰ However, is there a sound biblical basis to assume this? Probably not, for several reasons. There were around 1,600 years between creation and the Flood based on the genealogies in Genesis 5. In this time, some created kinds may have become extinct, while others could have diversified greatly. The kinds of animals Noah brought on the Ark would have been kinds recognizable to him, but not necessarily baramins in the taxonomic sense. Thus, some unclean baramins may have diversified enough that two from several distinct lineages were preserved. This allows for 2, 4, 6, or more descendants from a single baramin to be preserved. The fact that the wording of the Hebrew text allows for this possibility has implications for creation research.

If several lineages from a single baramin were preserved on the Ark, then it could give an unexpected signal in baraminological statistical analyses. A bit over a quarter of Earth history is before the Flood. If a baramin diversified greatly before the Flood, resulting in several ‘kinds’ at the time of Noah, and the lineages remained separate and continued to diversify after the Flood, one might find clustering (associated with a specific lineage) within a larger cluster (encompassing the kind). Certainly, this pattern could happen with even post-Flood diversification; however, multiple ‘Ark kinds’ from a baramin is likely to increase the frequency of and intensify such a signal.

The Flood was clearly a severe bottleneck in terrestrial and flying life forms. I have attempted to distinguish created genetic diversity from mutation by recognizing a maximum of four alleles (versions of a gene; every animal has two copies of a gene, one inherited from each parent) in any given unclean baramin making it through the Flood.³¹ The logic is that we are not told how individuals were created in each baramin at the beginning, but we are told how many

Table 3. A list of passages outside Genesis where the Hebrew “lamed + *mîn* + pronominal suffix” appears. The translation of the “lamed + *mîn* + pronominal suffix” construction is underlined; the name of the creature it refers to is in italics. Notice that translators interpret it as indicating more than one ‘kind’, in the general sense.

<p>the kite, <i>the falcon</i> <u>of any kind</u>, <i>every raven</i> <u>of any kind</u>, the ostrich, the nighthawk, the sea gull, <i>the hawk</i> <u>of any kind</u>, Leviticus 11:14–16</p>	<p>The underlined phrases are the same construction as is used in Genesis. Some translators take it to refer to all birds in the list, but here only the immediate antecedent is italicized.</p>
<p>the stork, <i>the heron</i> <u>of any kind</u>, the hoopoe, and the bat. Leviticus 11:19</p>	
<p>Of them you may eat: <i>the locust</i> <u>of any kind</u>, <i>the bald locust</i> <u>of any kind</u>, <i>the cricket</i> <u>of any kind</u>, and <i>the grasshopper</i> <u>of any kind</u>. Leviticus 11:22</p>	
<p>And these are unclean to you among the swarming things that swarm on the ground: the mole rat, the mouse, <i>the great lizard</i> <u>of any kind</u>, Leviticus 11:29</p>	
<p>the kite, <i>the falcon</i> <u>of any kind</u>; <i>every raven</i> <u>of any kind</u>; the ostrich, the nighthawk, the sea gull, <i>the hawk</i> <u>of any kind</u>; Deuteronomy 14:13–15</p>	
<p>the stork, <i>the heron</i> <u>of any kind</u>; the hoopoe and the bat. Deuteronomy 14:18</p>	
<p>Fishermen will stand beside the sea. From Engedi to En-eglaim it will be a place for the spreading of nets. <i>Its fish</i> will be <u>of very many kinds</u>, like the fish of the Great Sea. Ezekiel 47:10</p>	<p>The format in this passage varies a little from all the others in that “according to its kind” actually precedes the noun ‘fish’, and is connected by a form of the verb “to be”. It is part of a vision of the future temple.</p>

made it through the Flood; two for every unclean kind. If created kinds are not identical to Ark kinds, then one needs to take this into consideration so incorrect inferences are not drawn. Now, in the specific case I used, there are still good reasons to argue that several of the alleles are from mutation.³² So, the fact that I carried a questionable assumption did not automatically invalidate my conclusions.

Finally, one needs to exercise caution in using baraminology to identify the Flood/post-Flood boundary. If, for example, we have strong evidence that the baramin includes a family, it is not necessarily a problem if multiple genera cross the proposed Flood/post-Flood boundary. As with the previous argument for identifying created versus derived alleles, there are other lines of evidence that are also part of the argument. For example, when different genera are unique to specific continents, and they remain so right through a proposed boundary, it suggests that is not a viable option

as a Flood/post-Flood boundary.^{33–35} So, here again, even if there was a flawed assumption in the argument, it cannot be used to ignore the other components of the argument. In fact, Arment considers the possibility they are not equivalent in a paper explaining the implications of a Neogene-Quaternary Flood/post-Flood boundary.³⁶

In summary, it cannot be supported linguistically that the ‘kinds’ Noah took on the Ark have a one-to-one correspondence to the ‘kinds’ God created in Genesis 1. Given the years life had to diversify and fill the earth before the Flood, it would seem doubtful this is a reasonable assumption in many cases. This adds a level of complexity to baraminology and its application to creation-related questions. Hopefully, this initial analysis of the issues involved will further strengthen a responsible use of the relevant biblical data as we apply it to our scientific models.

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- Turner, ref. 3 p. 54.
- The lamed prefix has an associated reduced vowel when attached to its noun.
- See versions such as NIV, ESV, CSB, NET. The KJV and NAS use ‘after’ instead of ‘according to’. Checked using BibleWorks v. 7.
- Since Hebrew nouns have gender, the pronouns can be masculine or feminine, but they serve the same purpose as the English word ‘it’ in that they are referring back to a non-human entity in the usage described here.
- It even includes offspring of humans (Genesis 3:15, 12:7, etc.) and animals (Genesis 7:3). Most lexicons will detail its multivalent uses: e.g. Holladay, W.L., *A Concise Hebrew and Aramaic Lexicon of the Old Testament* Brill, Leiden, 2000; BibleWorks v. 7. Thus, the word does not convey the modern botanical distinction of coming from an angiosperm or a gymnosperm.
- The Hebrew word translated ‘bird’ in most versions is more adequately rendered ‘flyer’ as it also describes bats (Leviticus 11:19; Deuteronomy 14:18) and flying insects (Leviticus 11:20–23).
- I am not condoning the translation of these terms as it is not germane to this discussion. It has been pointed out the Hebrew word translated as ‘livestock’ (behemah) can refer to many animals that are not domesticated. See Holladay, W.L., *A Concise Hebrew and Aramaic Lexicon of the Old Testament* Brill, Leiden, 2000; BibleWorks v. 7.
- Discussed in depth in Turner, ref. 3.
- Discussed in more detail in Lightner, J.K., Hebrew Scriptures as an aid to developing a creationist taxonomy, *J. Creation* 24(1):77–81, 2010; creation.com/Hebrew-Scriptures-creationist-taxonomy.
- This is, by definition, evolution. However, in contrast with the popular model, the changes require the Creator to design pathways and mechanisms by which the organism can change. Also, change is limited, as many changes in complex biological organisms are lethal if they occur. Variation has arisen that 1) increases usefulness to man (agriculture), 2) adds interesting variety (beauty), and 3) allows the creature to adapt. There is no evidence that one kind of organism can change into a fundamentally different kind of organism. There are no plausible pathways by which this could be accomplished.
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Developments in paleoanthropology

Peter Line

This paper discusses some of the more recent fossil finds and/or developments in paleoanthropology from a creationist perspective. This includes a newly described *Homo erectus* cranium from South Africa, updates on *Homo naledi*, the controversy over a femur associated with *Sahelanthropus tchadensis*, and troubles for *Australopithecus sediba*. Also discussed is the European 'bipedal' ape *Danuvius guggenmosi*, as well as the implications such apes have on the supposed 'hominin' status of the australopithecines. The recently described Harbin cranium and Nesher Ramla *Homo* are also discussed.

Homo erectus in South Africa

In 2020 there was published the description of a *Homo erectus* cranium (DAN5/P1) from Gona, Afar, Ethiopia, with the exceedingly small cranial capacity of 598 cc (cubic centimetres), the smallest of any adult *Homo erectus* cranial capacity known in Africa.¹ I subsequently discussed this specimen, along with the partial *Homo erectus* cranium BSN12/P1 (also from Gona) that was also described in the above paper.² Another small *Homo erectus* cranium (DNH 134) was published soon after the DAN5/P1 cranium, but was not incorporated in my paper. DNH 134 (figure 1), along with an *Australopithecus* (*Paranthropus*) *robustus* cranium (DNH 152), were discovered in the Drimolen Main Quarry in South Africa and dated at between an alleged 1.95 to 2.04 Ma (million years ago).³ As for the setting the fossils were found in, Herries *et al.* reported that both “DNH 134 and DNH 152 were recovered partly from decalcified and partly from lightly calcified breccia and in close contact to solid breccia.”⁴ The DNH 134 cranium was recovered as a series of individual pieces during excavations in 2008, 2015, 2016, and 2019, with the single piece from 2008 said to be “not recognized as hominin until more of the cranium was recovered in 2015”.⁵

According to Herries *et al.*: “DNH 134 represents the oldest fossil with affinities to *H. erectus* in the world.”⁶ The cranial capacity was estimated at 538 cc, and assuming an age at death between 2 and 3 years, the authors estimated that the DNH 134 individual could have reached an adult cranial capacity between 588 and 661 cc according to a human model.⁷ Paleoanthropologist Susan Antón commented on the DNH 134 cranium assignment to *Homo erectus* as follows:

“The size and shape of the DNH 134 braincase (vault) merit its assignment to *Homo* and preclude its affiliation with two species of *Homo* living on the continent at the time (*H. rudolfensis* and *H. habilis*). *H. erectus* has a distinctly shaped vault compared with other early *Homo* species and one that is present even in young individuals; on this basis, the authors recognized

DNH 134 as *H. aff. erectus*.”⁸

The distinct cranial vault shape of *Homo erectus* mentioned by Antón is likely what Stephanie Baker, a researcher involved in the study, described as “the characteristic teardrop shape seen in all *Homo erectus* specimens”—when viewed from above.⁹ Baker also stated that the DNH 134 *Homo erectus* specimen is “the first recorded representative of the species in South Africa.”⁹ However, convincing arguments have been advanced that the adult SK 847 cranium from Swartkrans, South Africa, is *Homo erectus*,¹⁰ which would mean that DNH 134 is not the first recorded representative of *Homo erectus* in South Africa. For example, on the status of SK 847, paleoanthropologist Ronald Clarke stated in 1985 that:

“Although one cannot say whether 847 had a brain size like that of *Homo habilis* or early *Homo erectus*, the *erectus*-like morphology of the frontal bone (which is not seen in any of the *Homo habilis* crania) plus the remarkable overall similarity to 3733 convinces me that 847 must now be classified as an early *Homo erectus*.”¹¹

On the brain size of SK 847, due to the incompleteness of the specimen, which has most of its neurocranium missing, any estimate of its cranial capacity would be inaccurate, although it is likely to be very small.¹²

Of interest is the statement by Herries *et al.* that “DNH 134 is strikingly similar to the Mojokerto *H. erectus* cranium in overall cranial shape”, with the DNH 134 cranium superimposed on the Mojokerto cranium to illustrate the point.¹³ The cranium of the Mojokerto child from Mojokerto, Java, Indonesia was discovered in 1936, and has been dated to an alleged ~1.81 Ma—but later redated to <1.49 Ma.¹⁴ Its developmental age is uncertain, with proposed ages at death ranging between 0 and 8 years.¹⁴ According to Antón, “Reasonable cranial capacity estimates of the Mojokerto specimen range between 636 and 700 cc ... with a direct liquid replacement measurement of 673 cc”.¹⁵ Antón subsequently stated that:

“If Mojokerto’s development is comparable to that of a 4–6-year-old modern human when 80–90% of

cranial volume is attained ... , an adult cranial capacity of 740–860 cc would result, assuming *Hss* [*Homo sapiens sapiens*] neural growth standards.”¹⁵

That characteristic features of the *Homo erectus* morphology are present in juvenile specimens indicates that the key features of *Homo erectus* morphology arose during the developmental processes to maturity (the adult stage), and not during the aging process.

Also, the striking similarity between the DNH 134 and Mojokerto crania, specimens as far apart as South Africa and Indonesia, reinforces the notion that *Homo erectus* individuals from different regions of the world (e.g. Indonesia, China, East Africa, North Africa, India, Georgia, Turkey) ultimately trace their origins back to an original and diverse *Homo erectus* population, likely from Babel.¹⁶ Although not recent, there is also controversial evidence suggesting *Homo erectus* people may even have migrated to Mexico. According to evolutionist Jeff Meldrum:

“Nearly as controversial as sasquatch itself is the interpretation that a fragment of a fossilized human brow ridge found at Mexico’s Lake Chapala may be from the skull of a relic *Homo erectus*. The attribution is a matter of considerable debate, but the close resemblance of the fragment to the cranial anatomy of *Homo erectus* is inescapable.”¹⁷

According to Associated Press, Mexican professor Federico Solorzano, a teacher of anthropology and paleontology,

was sifting through his collection of old bones from the shores of Lake Chapala when he noticed “a mineral-darkened piece of brow ridge bone and a bit of jaw that didn’t match any modern skulls.”¹⁸ The article then goes on to state:

“But Solorzano found a perfect fit when he placed the brow against a model of the Old World’s Tautavel Man—member of a species, *Homo erectus*, that many believe was an ancestor of modern *Homo sapiens*.”¹⁸

If *Homo erectus* is established as having been in Mexico, then this would require evolutionists to further revise their ‘evolving’ models of human evolution. From the fuzzy photo of the brow ridge, it is difficult to comment on it.¹⁸ Hopefully, more fossils from this region are discovered in the future, which can shed more light on the above claim.

Homo naledi updates

The allocation of DNH 134 to *Homo erectus* raises the question of whether the specimens allocated to *Homo naledi* should also be subsumed into this category. This is especially so given that the Rising Star cave system, where the *Homo naledi* fossils were found, is only about 800 metres from Swartkrans,¹⁹ where SK 847 was discovered, and 7–8 km from the Drimolen site,²⁰ where DNH 134 was found. From a creationist viewpoint, all specimens genuinely belonging to *Homo erectus* should ultimately be reclassified as *Homo*

sapiens if *Homo erectus* individuals were fully human, i.e. descendants of Adam and Eve. The sites are within a few hours walking distance from each other, and its *erectus*-like specimens all have small brain size. Ignoring the evolutionary-assigned ages of the specimens, it seems reasonable to suggest there is a connection between the specimens.

I have previously suggested that *Homo naledi* were *erectus*-like post-Babel humans, and that some of the odd skeletal features observed in the fossils, including the very small cranial capacity, could possibly be explained if some of them suffered from cretinism, a developmental pathology.^{21,22} The small cranial capacity observed in many *Homo erectus* specimens was discussed in more detail by me in 2020.² Some, such as the small cranial capacities in the Dmanisi, Georgia *Homo erectus* group, may likewise be explained by a pathology, such as cretinism. If you include other ‘robust’

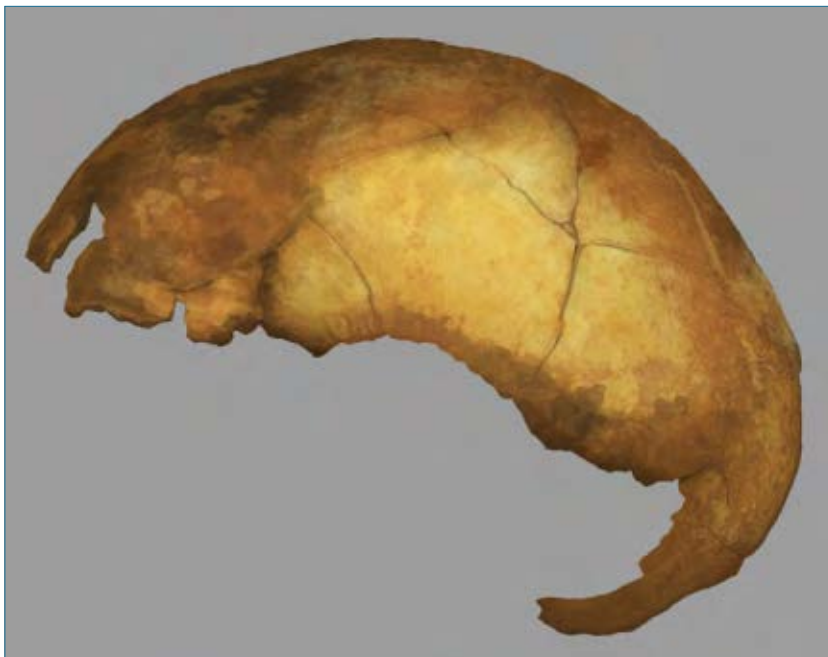


Figure 1. The juvenile DNH 134 *Homo erectus* cranium from Drimolen, South Africa. Allegedly dated at between 1.95 to 2.04 Ma, it is said to be the oldest *Homo erectus* fossil in the world, as well as the first recorded representative of *Homo erectus* in South Africa. Illustration based on a photo by: Herries, A.I.R. *et al.*, Contemporaneity of *Australopithecus*, *Paranthropus*, and early *Homo erectus* in South Africa, *Science* 368:47, 2020.

crania, which appear to be omitted from the *Homo erectus* category mainly because of their large cranial capacity (i.e. an example of circular reasoning), and related features, then it seems that there was a huge natural variation in cranial capacity of ‘robust’ humans. I also gave an example of a modern human with normal intelligence, whose cranial capacity was on the lower end of the *Homo erectus* range. This person’s cranial capacity would not have been that different in size to the DNH 134 *Homo erectus* cranium discussed above, if DNH 134 had reached adult cranial capacity. Also, some (but not all) of the difference in brain size between *Homo erectus* and modern humans may be explained by body size differences; this, on average, appearing to be larger in modern humans.² However, as yet there is no definitive answer as to why proportionally so many *Homo erectus* specimens had a small brain size, and hence a small cranial capacity.

More than five years have passed since *Homo naledi* was first announced to the world, and the fanfare over the fossils has subsided somewhat, as have publications on the finds. A study by Li *et al.* had as a major goal “to test the hypothesis that *Homo naledi* did not have a flat foot as it is widely considered by prominent researchers”.²³ From the study the authors reported that:

“Obtained results strongly suggest that *Homo naledi* does not have flat foot[sic]. Their relatively wide forefoot and narrow calcaneus reveal that *Homo naledi* is skilled in running with forefoot striking the ground, a better pattern for barefoot running because the ankle will be less likely to sprain. Running with forefoot striking can benefit from proprioception as well as the shock absorption function of longitudinal foot arch.”²⁴

This adds to the evidence that *Homo naledi* individuals were fully human, as does the relative limb size index (RLSI) measurement of the LES 1 (Neo) *Homo naledi* partial skeleton, the RLSI of LES 1 described as being “decidedly human-like”.²⁵ RLSI is used to quantify limb joint proportions per individual, and according to Prabhat *et al.* “is the logged ratio of geometric means calculated from upper (forelimb) and lower (hindlimb) limb measurements and quantifies whether a given specimen has relatively larger forelimb or hindlimb joints”.²⁶

Further support that the specimens assigned to *Homo naledi* were human comes from a study on the biomechanics and dexterity of the thumb. The study reported that efficient thumb opposition “did not characterize *Australopithecus*, the earliest proposed stone tool maker”, including “*Australopithecus sediba* [MH2 specimen], previously found to exhibit human-like thumb proportions.”²⁷ The efficiency was said to be “similar to that of present-day chimpanzees”.²⁸ This indicates that even if some australopithecines may structurally have exhibited human-like thumb proportions, functionally their ability to move the thumb, particularly in terms of opposition (i.e. bring the tip of the thumb in contact

with other fingertips of the same hand), was not any better than that of chimpanzees (who have shorter thumbs than humans). In contrast, it was reported that “later *Homo* species, including the small-brained *Homo naledi*, show high levels of thumb opposition dexterity”.²⁹ Commenting on the study, Parletta stated that “more recent hominins showed greater levels of thumb dexterity similar to those of modern humans, including Neanderthals and *Homo sapiens*, as well as *Homo naledi*.”²⁸ Discussing the high level of thumb dexterity in *Homo naledi* (figure 2 shows the *Homo naledi* hand), Karakostis *et al.* stated that:

“Although no artifacts have been found in association with this taxon as yet, such enhanced manual abilities in this small-brained species suggest a decoupling of the traditionally assumed correlation between brain size and tool-using skills in the fossil record and therefore a potential greater importance of brain complexity in cultural behavior.”³⁰

***Australopithecus sediba* troubles**

From an evolutionary viewpoint, the DNH 134 *Homo erectus* find (discussed above) essentially eliminates the possibility that *Australopithecus sediba*, supposedly dated to 1.977 Ma,³¹ was the ancestor to *Homo*. On this, Herries *et al.* commented that:

“It has been postulated that *A. sediba* is a good candidate for the ancestor of *Homo* ... , although much older fossils attributed to *Homo* exist ... *A. sediba* can only be ancestral to *Homo* in southern Africa if a



Figure 2: A dorsal view of the bones of the right hand of *Homo naledi*

Image: Kivell, T., Deane, A., Tocheri, M. *et al.*/CC BY 4.0



Figure 3. On the left is a cast of the *Australopithecus sediba* juvenile MH1 mandible (UW88-8) from the Malapa site, South Africa. On the right is a replica of a male chimpanzee mandible. Both are shown in right lateral view. The MH1 mandible is said to exhibit a 'specialized' shape of the mandibular notch. The chimpanzee exhibits a 'generalized' shape, which is what the MH2 *Australopithecus sediba* specimen is said to also exhibit. (Photo by Peter Line.)

population existed before DNH 134, for which there is no current evidence ...²⁶

Regarding *Australopithecus sediba*, a recent study by Rak *et al.* of the mandibles belonging to the two partial skeletons (MH1 and MH2) assigned to the species concluded that “the specimens represent two separate genera: *Australopithecus* and *Homo*”, with the MH1 individual suggested as belonging to *Australopithecus africanus*.³² The aspect of the mandibles examined was the upper ramal morphology, mainly the shape of the mandibular notch between the condylar process and coronoid process. According to Rak *et al.*: “the MH2 mandible falls in the group that exhibits the generalized configuration, a group that includes *H. sapiens*. The MH1 mandible [see figure 3], on the other hand, is clearly clustered with the australopithecines.”³³ This latter group (which includes MH1) is said to exhibit a ‘derived’ or ‘specialized’ configuration.³⁴ However, *Ardipithecus ramidus*, as well as chimpanzees and orangutans, also display the ‘generalized’ configuration of the former group (which includes MH2),³⁵ and so from a creation viewpoint one should not read too much into this finding.

Concerning “the question of the *Homo* species at play”, in regards to the MH2 individual, the authors stated that “we do not deal with nomenclature on a species level” and so did not answer that question.³³ When evolutionists label a specimen *Homo* or early *Homo* one has to consider the context, as it can mean human, as in, e.g., *Homo erectus*, but it can also mean *Homo habilis*. On *Homo habilis*, my assessment is that it appears to be a phantom species, i.e. a composite species made up of mostly australopithecine remains, but also a few *Homo erectus* remains, that have been bundled together and marketed as an ‘apeman’ (hominin) species.³⁶ Rak *et al.* concluded that “*Au. sediba* seems to represent a mixture of two hominin taxa, leading Berger *et al.* to refer to the new species as a transitional one”.³³ The authors finished their paper with the following statement:

“All the australopithecines on which the relevant ramal morphology is preserved (*Au. afarensis*; *Au. africanus*, including the *Australopithecus* specimen at Malapa; and certainly *Au. robustus*) are actually too derived to play the role of a *H. sapiens* ancestor. Given that Malapa already contains representatives of two hominin branches, one of which appears to be *Homo*, we must seek the latter’s origin in geological layers that are earlier than those at Malapa, which are dated at approximately 2 million years before present ... Support for such a scenario can be found in earlier Ethiopian

fossils attributed to the genus *Homo*: A.L. 666, dated at 2.4 million years ..., and LD 3501, dated at 2.8 million years ...”³⁷

From the above statement, it seems that Rak *et al.* have a different evolutionary scenario in mind, with an origin of *Homo* that does not include *Australopithecus sediba*. In my assessment the MH1 and MH2 *Australopithecus sediba* specimens both belong with the australopithecines,³⁸ an extinct apish primate group, and the study by Rak *et al.*, being heavily based on evolutionary interpretations, does little to change this. However, no doubt there is more to come in this dispute between opposing evolutionary groups.

Bipedal apes and the australopithecines

John Relethford, in discussing general characteristics “shared by all of the early hominins” in his textbook on biological anthropology, stated that “All are classified as hominin because they show evidence, direct or indirect, of being bipedal (although, as noted below, some of this evidence for the earliest possible hominins is being debated).”³⁹ As stated by Tracy Kivell:

“The commitment to terrestrial bipedalism, characterized by skeletal adaptations for walking regularly on two feet, is a defining feature that enables the assignment of fossils to the hominin lineage—which comprises all species more closely related to humans than to chimpanzees (*Pan troglodytes*) or bonobos (*Pan paniscus*), our two closest living relatives.”⁴⁰

As indicated above, bipedalism is the defining feature that evolutionists use to assign fossils to the ‘hominin’ (or ‘hominid’) lineage. As such, numerous documentaries, books, magazine articles, etc., promote the idea that ape-like creatures in Africa were on their way to becoming human because their fossils indicated they walked upright in some manner. As an example, consider the statement by Brian Handwerk

in a recent article for the *Smithsonian Magazine*:

“The long evolutionary journey that created modern humans began with a single step—or more accurately—with the ability to walk on two legs. One of our earliest-known ancestors, *Sahelanthropus*, began the slow transition from ape-like movement some six million years ago, but *Homo sapiens* wouldn’t show up for more than five million years.”⁴¹

However, what if apes living supposedly millions of years earlier than this already walked upright—yet remained apes? Bipedalism would then be nothing novel, and animals like the apish australopithecines (members assigned to the genus *Australopithecus*) were likely, like these other ‘bipedal’ apes, simply an extinct group of apish primates unconnected to any supposed evolutionary lineage.

First there was *Oreopithecus bambolii*, then later *Rudapithecus hungaricus*, followed soon after by *Danuvius guggenmosi*, all fossil apes from Europe with claims of upright posture and/or being bipedal.⁴² Dated to allegedly 11.62 Ma, *Danuvius guggenmosi*, according to its discoverer Madelaine Böhme, had unusual features for an ape, i.e. the “ability to stand straight with its knees and hips fully extended and a lower back that curved gently to lend it stability.”⁴³ Böhme points out that when “today’s great apes stand on two feet, they keep their knees and hips bent”, and their “lower backs are inflexible and too short for them to be able to stand upright with extended hips.”⁴⁴ Paleoanthropologist Jeremy DeSilva, who has examined the *Danuvius guggenmosi* fossils, stated that:

“Böhme and her team concluded that over 11 million years ago *Danuvius* was upright and walked not on the ground, but in the trees. If Böhme is right, bipedalism did not emerge from the ground up, but from the trees down. From my own observations of the fossils, I saw no reason to contradict these findings, but they remain controversial and contested.”⁴⁵

As indicated, the above finding is a real blow to the idea that bipedalism equals hominin (i.e. apeman). That is, if apes/primates in Europe were built for some form of bipedalism and/or upright posture, yet were not hominins, then why would bipedal-like features in the australopithecines from Africa mean they were hominins? Hence, the argument of evolutionists that the australopithecines were hominins because they were in some way bipedal collapses. In fact, however, the argument that the australopithecines



Figure 4. A cast of the ‘unreconstructed’ *Sahelanthropus tchadensis* Toumai cranium (TM 266-01-60-1) (photo by Peter Line)

were hominins because they were bipedal is invalid reasoning *per se*, regardless of whether there were ‘bipedal’ apes/primates in Europe or not.

The Bible does not address the issue of locomotion in primates, and so, from a creation viewpoint, if bipedal ape-like primates existed, it does not contradict Scripture. If God created humans bipedal, why would He not use variation on a similar design pattern for some other primates? Given how many non-human primates there are, if considering both extant and extinct species, it would in some ways seem a bit unusual if He had not. The australopithecines may have been one such primate group.

According to evolutionist authority Charles Oxnard, “The various australopithecines are, indeed, more different from both African apes and humans in most features than these latter are from each other.”⁴⁶ He further stated that:

“For instance, though bipedal, it is likely that their bipedality was mechanically different from that of humans. Though terrestrial, it is further likely that these fossils were accomplished arborealists. The combination of the two functions within the same set of creatures is certainly unique among hominoids.”⁴⁶

According to DeSilva:

“We used to think that throughout human evolution, there was only one way to walk. But we now know that is not the case. Millions of years ago, different yet related species of upright walking *Australopithecus*, living in different environments, walked in slightly different ways.”⁴⁷

Putting aside the above evolutionary assumptions, from a creation viewpoint the australopithecines appear to have been unique primates that were at home in the trees, as well as on the ground. If they were capable of an upright

posture, it was likely a design feature also useful for life in the trees, e.g. for reaching overhanging fruit with their hands while walking on a limb, as well as for tree climbing. So any ‘bipedal’ locomotion was not necessarily like that of humans. The australopithecines appear to have exhibited considerable variation, as do the great apes, and so the locomotor pattern likely varied between different species in the genus *Australopithecus*. Likely, the australopithecines were an extinct apish primate group, and, while ape-like, may not necessarily be best regarded as apes, in the sense that monkeys are not classified as apes either.

The *Sahelanthropus* femur

The Toumaï cranium (figure 4), assigned to the species *Sahelanthropus tchadensis* and promoted in 2002 as the earliest known hominin, in my assessment appears to have belonged to an extinct ape/ape-like primate, with claims of bipedalism unsubstantiated.⁴⁸ The possible existence of a *Sahelanthropus tchadensis* femur received considerable attention in 2018, but it still remained unpublished and shrouded in secrecy.⁴⁹ In 2020 a study on the femur (referred to as the TM 266 femur) was finally published, and its finding, that “the overall morphology of TM 266 appears to be closer to that of common chimpanzees than to that of habitually bipedal modern humans”,⁵⁰ poured more doubt on the ‘hominin’ and bipedal status of *Sahelanthropus tchadensis*. The authors (Macchiarelli *et al.*) of the study concluded that the “lack of clear evidence that the TM 266 femur is from a hominid that was habitually bipedal further weakens the already weak case ... for *S. tchadensis* being a stem hominin.”⁵¹ Reporting on this in *New Scientist*, Michael Marshall summed up the finding as follows:

“The leg bone suggests that *Sahelanthropus tchadensis*, the earliest species generally regarded as an early human, or hominin, didn’t walk on two legs, and therefore may not have been a hominin at all, but rather

was more closely related to other apes like chimps.”⁵²

The lead scientist of the group that discovered the remains of *Sahelanthropus tchadensis*, Michel Brunet of the University of Poitiers, France, was asked about the femur in 2019 by DeSilva. Brunet is quoted as saying “Toumaï was biped. Yes? If the femur is from biped, then it is from Toumaï. Yes? If it is not from biped, then not from Toumaï.”⁵³ DeSilva went on to state that “According to Brunet, *Sahelanthropus* was bipedal, the case is closed, and more study or additional fossils—no matter what they look like—will not change his mind.”⁵⁴ As indicated above, if Toumaï was not bipedal then from an evolutionary viewpoint it could not have been a hominin, and it would hence lose its ‘prestigious’ status as the earliest (stem) hominin. It would also mean the extraordinary media hype surrounding its announcement as the earliest known hominin was fake news.⁵⁴

A paper by another group (Guy *et al.*), disputing the finding of the Macchiarelli *et al.* study (discussed above), and so more favorable to Brunet’s view (although he is not an author), has been published as a preprint under consideration at a Nature Portfolio Journal.⁵⁵ According to Marshall, “Guy and his colleagues say the femur does show signs of bipedality”, but “Other palaeoanthropologists agree with the analysis by Bergeret-Medina’s team [i.e. Macchiarelli *et al.*].”⁵² It seems the dust has not yet settled on this dispute.

Nesher Ramla *Homo*

As I was about to submit the article to the journal editor, a ‘new’ type of human, called Nesher Ramla (NR) *Homo* (figure 5), from Nesher, Ramla, Israel, dated to allegedly 140 to 120 ka (thousand year ago), was announced in the journal *Science*.⁵⁶ The NR-1 fossil consisted of an almost complete right parietal bone and four fragments of the left parietal, whereas the NR-2 fossil consisted of an almost complete mandible (including a lower left second molar), with both fossils said to likely represent the same NR individual.⁵⁷ From analysis of the fossils, the parietal bone appears to show the closest affinity with some specimens classified as *Homo erectus* and Middle Pleistocene (MP) *Homo* (usually specimens thrown into the *Homo heidelbergensis* category), the mandible appears to show the closest affinity with some specimens classified as Neanderthals and Middle Pleistocene *Homo*, with the molar being closest to Neanderthals.⁵⁸ Summarizing the morphology of NR *Homo*, paleoanthropologist Roberto Sáez wrote:

“The study shows the proximity of its features to the Neandertal



Figure 5. The Nesher Ramla human mandible (left) and parietal bone (right)

Image: Avi Levin and Ilan Theiler, Sackler Faculty of Medicine, Tel Aviv University

morphology (such as the shape of the jaw, including the absence of a chin, and the characteristics of the teeth), but also affinities with hominins of 400 ka (in more archaic features of the skull, some similar to those in *Homo erectus*).⁵⁹

In *Science*, Marta Lahr writes that the Nesher Ramla fossils “suggest that a different population, with anatomical features more archaic than those of both humans and Neanderthals, lived in this region at broadly the same time.”⁶⁰ According to the authors of the study (Hershkovitz *et al.*) the “NR fossils could represent late-surviving examples (140 to 120 ka) of a distinctive Southwest Asian MP *Homo* group”.⁶¹ Adding other MP Levantine fossils to this group, the authors wrote:

“... we suggest addressing this Levantine MP paleodeme as the ‘Nesher Ramla Homo’. Its presence from ~420 to 120 ka ago in a geographically restricted area may have allowed for repeated interbreeding with modern human populations such as the people from Misliya Cave ... , a notion also supported by their shared technological tradition This scenario is compatible with evidence of an early (200 to 400 ka ago) gene flow between modern humans and Neanderthals ... and helps explain the variable expression of the dental and skeletal features of later Levantine fossils from the Skhul and Qafzeh populations.”⁶²

Evolutionist Lahr commented that the discovery at Nesher Ramla raises “questions about the coexistence of different hominin populations in this region and complex population dynamics in the Late Pleistocene.”⁶⁰ From the above, it seems that the authors of the study already acknowledge the notion that NR *Homo* individuals may have been interbreeding with modern humans, and so from the biological species concept that would make them the same species. Hybridization between subgroups within the same species can give rise to appearances that are sometimes ‘blended’ in general character, and at other times mosaic. Hence, from a creation viewpoint, if there was a diverse human population at Babel, including people with ‘robust’ features, such as *Homo erectus*, then interbreeding between the different human population subgroups may well explain the NR *Homo* individuals.

In a companion paper in the same issue of *Science*, Zaidner *et al.* wrote: “The evidence from Nesher Ramla demonstrates that late MP *Homo* fully mastered advanced Levallois technology that until only recently was linked to either *H. sapiens* or Neanderthals.”⁶³ This indicates, as far as intelligence is concerned, that NR *Homo* individuals were not inferior to modern

humans. According to Bruce Bower, “Attempts to extract DNA from the Nesher Ramla fossils, which would reveal whether interbreeding took place, have failed.”⁶⁴

Dragon Man

About the same time as the ‘new’ Nesher Ramla *Homo* type human from Israel was announced, another ‘new’ human, this time from China, officially named *Homo longi*,⁶⁵ was also revealed to the world. The fossil in question was a well-preserved cranium, called the Harbin cranium (figure 6), nicknamed Dragon Man. It got a lot of publicity in the media, with headlines such as “‘Dragon Man’: Scientists say new human species is our closest ancestor”.⁶⁶ The opening paragraph of this article said the skull “represents a new species of ancient people more closely related to us than even Neanderthals—and could fundamentally alter our understanding of human evolution, scientists announced Friday.”⁶⁶ Catchphrases, such as “could fundamentally alter our understanding of human evolution”, are used so often, nearly with every new find, that they are meaningless. Although it does indicate that the theory of human evolution is built on shifting sands—not a very good foundation.

The Harbin cranium was handed over to paleontologist Ji Qiang at the Hebei GEO University in 2018 by a farmer who said the skull had been dug up by a coworker of his grandfather in 1933.⁶⁷ The cranium was apparently found buried in the riverbank during bridge construction, and subsequently hid in a well to prevent the Japanese from finding it.⁶⁸ Regardless of the mysterious circumstances surrounding the discovery and previous whereabouts of the cranium, it is nonetheless a very interesting find. Because of its confused history, the exact geographic location of the find remains uncertain, but the researchers directly dated the cranium by the uranium-series disequilibrium method, which allegedly suggested that the cranium was older than 146 ka.⁶⁹

The cranium is stated as having been recovered in Harbin city in northeastern China. And it is said to be one of the best preserved MP human fossils, massive in size, with a cranial



Figure 6. The Harbin cranium, assigned to the newly named human species *Homo longi*

Image: Xijun Ni of the Chinese Academy of Sciences and Hebei GEO University

capacity of 1,420 cc, “combined with a mosaic of primitive and derived characters.”⁷⁰ The authors of the study stated that the Harbin cranium “is characterized by a combination of large cranial capacity, short face, and small cheek [sic] bones as in *H. sapiens*, but also a low vault, strong browridges, large molars, and alveolar prognathism as in most archaic humans.”⁷⁰ The authors said that the Harbin cranium showed “the greatest resemblances to Middle Pleistocene Chinese fossils, such as Hualongdong, Dali, and Jinniushan”, and that their “analyses also suggest a potential link between the Harbin cranium and the Xiahe mandible, a fossil attributed to the Denisovan lineage.”⁷¹ According to Ann Gibbons, the authors have yet to test that idea by attempting to extract ancient DNA or proteins from the cranium.⁶⁸

Gibbons also stated that other researchers “question how the skull was found to be closely related to the Xiahe jawbone, because there are no overlapping traits to compare as the skull has no jawbone.”⁶⁸ However, as reported by Laura Geggel, some specialists in human evolution believe it is possible that the Harbin cranium is a Denisovan fossil.⁷² Alison George quoted more paleoanthropologists of that opinion, and also stated that “Although there is excitement at the possibility that the Harbin skull might be Denisovan, there is less enthusiasm about the decision to officially name it as a new species.”⁷³ According to Maya Wei-Haas, “not all the scientists and outside experts agree that Dragon Man is a separate species—nor do they agree about its relative position on the hominin family tree.”⁷⁴ Writing for *National Geographic*, Wei-Haas added:

“Many of the skull’s defining characteristics seem to be matters of scale rather than distinct features, says Buck, of Liverpool John Moores University. Even within a species, she says, some variation is expected. Differences in sex, age of the individual, regional adaptations, age of the fossil, and more can all drive slight individual changes.”⁷⁴

Others, like paleoanthropologist Chris Stringer (a study co-author), believe the Harbin cranium belongs with another species, as stated by Handwerk:

“He currently favors a view that the Harbin fossil and the Dali skull, a nearly complete 250,000-year-old specimen found in China’s Shaanxi province which also displays an interesting mix of features, might be grouped as a different species dubbed *H. daliensis*.”⁷⁵

The Dali cranium has affinities with *Homo erectus* and *Homo heidelbergensis*, indicating that *erectus* and *heidelbergensis* are not separate species,⁷⁶ but are subgroups of the same species. From a creation viewpoint, fossil finds such as the Harbin cranium and Nesher Ramla *Homo* appear to reinforce this point, i.e. that what we are looking at are variations within a single species. It seems to be reinforcing creationist understanding of a continuum of variation between humans broadly categorized as *Homo erectus*, *Homo heidelbergensis*, *Homo neanderthalensis*, Denisovan, and *Homo sapiens*, with these two new finds further connecting the dots, but not in an evolutionary sense. Interbreeding between the different

human population subgroups may well explain the features observed. As already mentioned, hybridization between subgroups within the same species can give rise to appearances that are sometimes ‘blended’ in general character, and at other times mosaic. Even if a combination of features has not been observed before, it does not warrant new species status, particularly based on just one or a few individuals.

Conclusions

The striking similarity between the DNH 134 and Mojokerto crania, specimens as far apart as South Africa and Indonesia, supports the notion that *Homo erectus* individuals from different regions of the world ultimately trace their origins back to an original and diverse *Homo erectus* population, likely from Babel. Studies indicating that *Homo naledi* did not have a flat foot, and that its level of thumb dexterity was like those of modern humans, further support the view that these individuals were fully human. That *Homo naledi* was human is also supported by the discovery of a *Homo erectus* cranium (DNH 134) about 7–8 km away (at Drimolen) from the *Homo naledi* site, the Rising Star cave system, as there is likely a connection between them. The discovery of European apes, like *Danuvius guggenmosi*, that appear to be capable of an upright posture and some form of bipedalism, linked to their tree-dwelling lifestyle, nullifies the argument that the australopithecines were hominins (i.e. apemen) simply because some of them may have been capable of some form of bipedalism. After a long delay, publication of the femur associated with *Sahelanthropus tchadensis* has caused more controversy, as well as raising more doubt that it was bipedal, and hence, from an evolutionary viewpoint, doubt that it was a hominin. The recently described Harbin cranium and Nesher Ramla *Homo* may reflect interbreeding between the different human population subgroups.

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Peter Line’s undergraduate major was in biophysics. After that he completed a Masters Degree and a Ph.D., both in the area of neuroscience. He has had a keen interest in the creation/evolution issue ever since becoming a Christian, as evolution was a stumbling block to him believing God’s Word was true.

Evaluating the origin of salt deposits and salt structures

Jacob Blom

Several creationist hypotheses have been proposed to explain the origin of salt deposits without invoking solar evaporation. In this paper, I evaluate the hypothesis in a recent paper by Heerema and van Heugten that explains salt deposits by means of igneous activity. I argue for a sedimentary, cold-water origin of salt deposits and the formation of salt structures by means of solid-state salt flow. Any creationist model needs to account for all characteristics of salt deposits.

Salt¹ deposits are generally understood as the result of solar evaporation in an isolated or semi-isolated basin.² In an isolated basin, net evaporation will increase the concentration of salts in the water, eventually leading to precipitation. In a semi-isolated basin, precipitation can occur as long as the outflow of salt is less than the inflow. The Mediterranean Sea, which was a salt basin in the past, serves as a model for these two models. In the 1970s, the Messinian salt deposits were explained by a complete desiccation of the Mediterranean Sea.³ In the last decades, modelling studies have demonstrated the possibility of salt deposition with a seaway between the Atlantic Ocean and the Mediterranean Seaway that continuously supplied salt.^{4,5}

Although the theory of solar evaporation has been the consensus since the late 19th century, several geologists have advocated other interpretations. Rode⁶ and Sozansky⁷ proposed an igneous origin of salt deposits, but did not garner much support in the geologic community. Currently, Martin Hovland *et al.* advocate a hydrothermal origin of many salt deposits.⁸ Since evaporation is a process that is too slow to create thick salt layers within a young-earth timeframe, creationists have also developed hydrothermal and igneous models. Most creationists favour a hydrothermal model, defended in most detail by David Nutting⁹ and Andrew A. Snelling.¹⁰ In contrast, Stef J. Heerema and Gert-Jan H.A. van Heugten have proposed an alternative hypothesis that tries to explain how salt deposits could have formed rapidly during the Flood.¹¹ Furthermore, their hypothesis also suggests an explanation for the origin of salt structures, such as diapirs. Heerema and van Heugten argue that salt deposits are the result of a salt magma that erupted underneath the sediment-rich waters of the Flood. Diapirism is explained by a buoyancy-driven process as a result of the density contrast between the liquid salt and the water-soaked sediments.

The hypothesis of Heerema and van Heugten will be examined and their arguments evaluated. I will argue that their hypothesis lacks explanatory power and sketch an alternative model.

The sedimentary origin of salt deposits

Primary crystals in salt deposits can have a wide range of morphologies. B. Charlotte Schreiber provides examples of these morphologies from the salt deposits of the Mediterranean and Michigan Basin.¹² These morphologies (e.g. twinned gypsum crystals, lenticular gypsum, halite hoppers, and chevron halite) are also formed in laboratory evaporation experiments,¹³ modern solar ponds,¹⁴ and salt pans.¹⁵ In the Messinian deposits of the Mediterranean, alternations of thin salt layers with shale can be found at multiple levels, which demonstrates a low-temperature, sedimentary origin of these salt layers.¹⁶ Resedimented salts (salts that have been eroded and transported) can contain numerous sedimentary structures, e.g. cross-bedding and turbidite structures.¹⁷ Despite the fact that large portions of salt deposits have lost their primary features as a result of diagenesis and salt tectonics, most formations contain several of the above characteristics that indicate a sedimentary origin.

It has not been demonstrated that an igneous model can account for many of these characteristics. In addition, most salt deposits contain several minerals that are unstable under high temperatures, such as gypsum, which loses its water between 100 and 150°C and becomes anhydrite.¹⁸ The crystal morphology of gypsum in many salt deposits suggests a primary origin, whereas anhydrite can sometimes retain the structure of the gypsum it originated from, demonstrating a secondary origin.¹⁹ Likewise, clay minerals that are present in small quantities in rock salt²⁰ and in siliciclastic layers interbedded in salt formations²¹ exclude a high-temperature origin of salt deposits, as these minerals would have disappeared due to contact metamorphism.

Heerema²² pointed out that many salt deposits contain almost no siliciclastic sediment or fossils and used this as an argument against the theory of evaporation. The absence of large amounts of siliciclastic sediments can be explained by the difference between the precipitation rate of salt and the average rate of siliciclastic sediment deposition in a

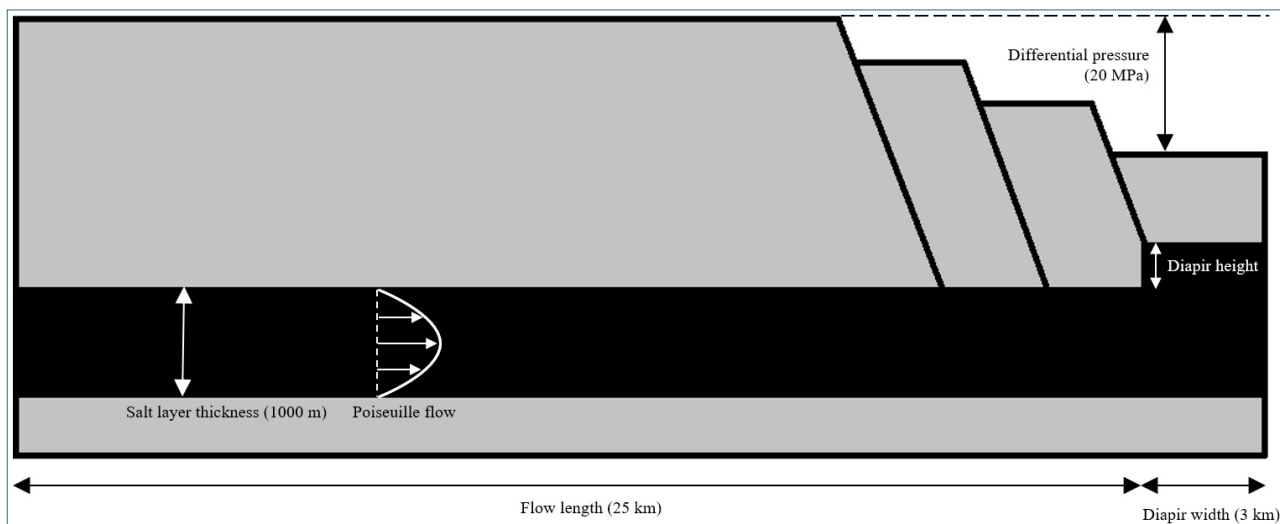


Figure 1. Sketch (not to scale) of the situation used to model the rise of a salt diapir in figure 2

large basin. Moderate evaporation rates can lead to the precipitation of 2–5 cm of gypsum and 2 to >10 cm of halite,²³ while the present elastic sedimentation rate is < 0.1 cm/yr.²⁴ Since hypersaline environments are almost entirely devoid of multicellular life,²⁵ the absence of macrofossils can easily be explained. Microfossils such as pollen,²⁶ bacteria,²⁷ and microbial laminations²⁸ are regularly found in salt deposits, consistent with a sedimentary origin.

The origin of salt structures

A common feature of salt deposits is the presence of salt structures, such as walls and diapirs. These structures are generally interpreted as the result of solid salt flowing like a fluid over long periods of time.²⁹ Strain in samples of natural rock salt was measured at differential stresses as low as 0.2 MPa,³⁰ indicating that salt will deform in various geological situations. Processes like dislocation creep and pressure-solution creep make it possible that solid salt behaves like a viscous fluid. For example, salt deposits often act as décollements in thrust belts, as is the case in the Pyrenees, which are called “a salt-based folded belt”.³¹ If the pressure is lowered at some point above a salt layer (e.g. because of the formation of a graben), salt will move upwards until the pressure is balanced. If the average density of the overburden is higher than the density of the salt (which is 2,200 kg/m³ or even lower³²), the salt will even reach the surface and spread out.

Heerema and van Heugten criticize the differential loading model of salt tectonics by referring to the difference in pressure gradient between laboratory and natural settings.³³ However, the laboratory experiments they refer to do not work with pressure gradients, since the entire salt cylinder is subject to the same anisotropic vertical and horizontal

stresses. The creep behaviour of salt in these experiments demonstrates that we can model salt as a Newtonian fluid with a viscosity that is given by the relationship between differential stress and strain rate. In most natural settings, the dynamic viscosity of rock salt lies between 10¹⁷ and 10²⁰ Pa.s.³⁴ Using the equation for two-dimensional plane Poiseuille flow between two plates and assuming no elevation difference, we can determine the discharge per unit width in a salt layer:³⁵

$$q(t) = \frac{h^3}{12\eta} \frac{\Delta P(t)}{L} \quad (1)$$

where

$$\Delta P(t) = \Delta P_0 - h_d(t)\rho_s g \quad (2)$$

where

$$h_d(t) = \int_0^t \frac{q(t)}{w} dt \quad (3)$$

Here $q(t)$ denotes discharge per unit width, h thickness of the salt layer, η the dynamic viscosity, $\Delta P(t)$ the differential pressure, L the flow length, ΔP_0 the initial differential pressure, $h_d(t)$ the diapir height, ρ_s the salt density, g the gravitational acceleration, and w the width of the diapir. Following Heerema and van Heugten, we can assume an initial differential pressure of 20 MPa and salt flow over a length of 25 km, which entails an initial pressure gradient of 8×10^{-4} MPa/m. I further use a salt layer thickness of 1,000 m, a viscosity of 10¹⁸ Pa.s, a density of 2,200 kg/m³, a gravitational acceleration of 9.8 m/s² and a diapir width of 3,000 m. Figure 1 gives an overview of these constants and variables in the model. If we run this model, a diapir height of almost 500 m is reached after a million years (figure 2).

This demonstrates the possibility of diapir formation within the timeframe of uniformitarian geology.

This simplified model can be made more realistic by adding several factors that enhance or resist salt flow. Instead of lifting up the overburden, the diapir can push its roof aside, which lowers the pressure above the diapir; erosion of the roof also lowers the pressure. Compressional tectonic forces, a lower viscosity due to lower grain sizes or higher temperature, an elevation head gradient, and thermal loading can also drive salt flow. Weak salts such as bischofite and carnallite can result in higher strain rates, lowering the overall viscosity of salt.

On the other hand, the strength of the overburden, the movement of the overburden in the opposite direction, and the presence of salts with a high viscosity (e.g. anhydrite) are factors that resist salt flow. Equation (1) shows that discharge is proportional to the cube of the salt layer thickness. As a result, salt flow decreases due to thinning of the salt layer.³⁶ Numerical models that take these factors into account demonstrate the possibility of the formation of salt diapirs in millions of years.^{34,37,38}

The formation of salt structures can take place in numerous settings, creating various types of diapirs and other structures. However, tectonic faults are in almost all cases needed to create a differential pressure (in extensional regimes) or pierce the roof of the diapir (in compressional regimes). The standard model of salt tectonics predicts therefore a strong association between faults and diapirs. This prediction is confirmed by salt structures worldwide. For example, Miocene salt walls in the Red Sea all lie in grabens³⁹ and diapirs of the Carboniferous Paradox Formation of Utah and Colorado are correlated to the Late Paleozoic Uncompahgre Uplift, which triggered the formation of a sequence of salt walls.⁴⁰

Evaluating the evidence for igneous salt

Barnhart⁴¹ has already commented on the evidence for salt magmas that is put forward by Heerema and van Heugten. The natrocarbonatite magma of Ol Doinyo Lengai, Tanzania, mainly consists of nyerereite and gregoryite and is probably the result of considerable differentiation.⁴² The magma contains small quantities of halite and sylvite, which crystallize together into a solid solution during a late stage of magma cooling. An igneous model for salt formations needs to account for the fact that halite layers in salt deposits contain almost no sylvite, but sylvite may occasionally be found in separate layers on top of the halite. The late crystallization creates the possibility that further differentiation of a natrocarbonatite would result in a NaCl-rich magma. However, such a far-reaching differentiation is unlikely to have happened quickly during the Flood, and it is unclear how such

a complex process could have led to the enormous volumes of salt that are present in salt deposits.

Another indication of a salt magma would be the existence of primary igneous anhydrite.⁴³ In various igneous rocks, anhydrite occurs as phenocrysts or inclusions. It often co-nucleates together with apatite, a mineral that is not present in salt deposits. Its $\delta^{34}\text{S}$ value is comparable to other igneous rocks and well outside the range of $\delta^{34}\text{S}$ values of anhydrite in salt deposits.⁴⁴ The isotopic differences and context of igneous anhydrite make a comparison with anhydrite in salt deposits unwarranted.

According to Heerema and van Heugten, the layering of salt deposits could potentially be explained by the solidification behaviour of ionic liquids (i.e. liquids composed entirely of ionic compounds). However, ionic liquids often form a structure of microscopic *lamellae* and other structures that are not present in salt deposits.⁴⁵ The macroscopic layering of salt deposits poses a problem for an igneous model as well, since many salt deposits contain an anhydrite or gypsum layer both near the bottom and near the top of the formation. This is generally explained as the result of the increase and decrease of the salinity in the basin, respectively.

Evaluating the evidence for magmatic diapirism

Heerema and van Heugten argue that diapirism in solid state is impossible and suppose that diapirism took place when the salt deposit was still a magma and the overlying sediments were soft and unconsolidated. They compare the structure of a Rayleigh-Taylor instability to salt diapirs in a compressional basin. However, the superficial similarity between these structures can be explained by the fact that solid salt indeed behaves like a buoyant fluid, whereas the differences can be explained by the brittle behaviour of the overburden. The turbulence of a real Rayleigh-Taylor instability would lead to vortices with intricate mixing of salt and sediments.

Several characteristics of diapirs contradict an origin in liquid phase. For example, diapirs often retain the structure of distinct layers of the undeformed salt.⁴⁶ Turbulent flow in liquid phase would have mixed these layers. The relatively high density of a salt magma would have made it difficult to pierce through the unconsolidated sediments of the overburden and flow over the surface or sea bottom. Unlike magmatic intrusions, salt diapirs do not contain a contact metamorphic halo. The igneous model of diapirism also lacks an explanation for the relation between diapirs and faults, especially since the model suggests that the sediments of the overburden were water-soaked during diapirism, which would have prevented the formation of faults. These characteristics make it highly improbable that salt structures are the result of magmatic diapirism.

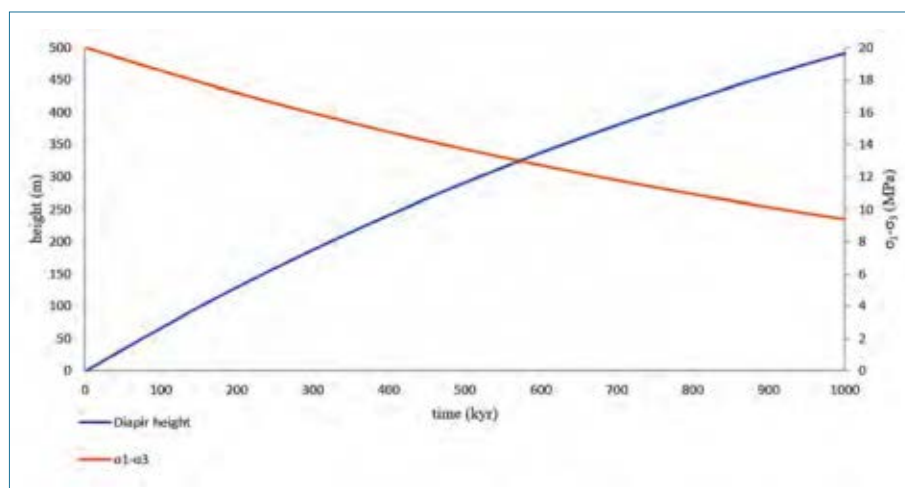


Figure 2. Development of diapir height and differential pressure with a salt viscosity of 10^{18} Pa·s and a density of $2,200 \text{ kg/m}^3$. Other variables are specified in figure 1.

Creationists need to consider other mechanisms

Creationists need to take the arguments in favour of a cold-water sedimentary origin of salt deposits into account. There are some processes that may explain salt deposits within a young-earth framework. First, serpentinized lithosphere can host large volumes of salt, which escape as NaCl-rich brines during subduction.^{47,48} Upon cooling, these brines will result in large flows of brine and particulate salt, which can presently be observed at the bottom of the Red Sea.⁴⁹ Evaporation could further enhance precipitation from the concentrated brine. Second, large tectonic forces during and after the Flood, combined with a very low viscosity of salt as a result of high temperatures, small grain sizes and high water content, can enhance the flow rate of salt in solid state.³⁴ Using equations (1) to (3) in the same way as before but with a viscosity which is a thousand times lower (i.e. 10^{15} Pa·s) results in a diapir that rises a thousand times faster, i.e. 500 m in about 1,000 years. This very low viscosity falls within the range of viscosities observed in salt glaciers,⁵⁰ which indicates that it is possible under highly favourable conditions.

These processes could account for more of the characteristics of salt deposits than the hypothesis of igneous salt. However, a detailed examination of individual salt deposits is needed to determine their validity.

Conclusion

Crystal morphologies and sedimentary structures show that salt deposits most likely have a sedimentary origin. The physics governing salt tectonics demonstrate the possibility of diapirism as a result of the flow of solid salt. On

the other hand, the hypothesis that tries to explain salt deposits and salt structures as the result of igneous activity during the Flood fails to account for a large array of data. Therefore, creationists should develop an alternative sedimentary model that accounts for the origin of salt deposits and rapid solid-state salt flow that accounts for the origin of salt structures.

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1. Salt deposits can consist of a variety of salts, with halite (NaCl) and gypsum/anhydrite ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ and CaSO_4 , respectively) being the most common. Salt tectonics has normally taken place in deposits or parts of deposits which consist mainly of halite.
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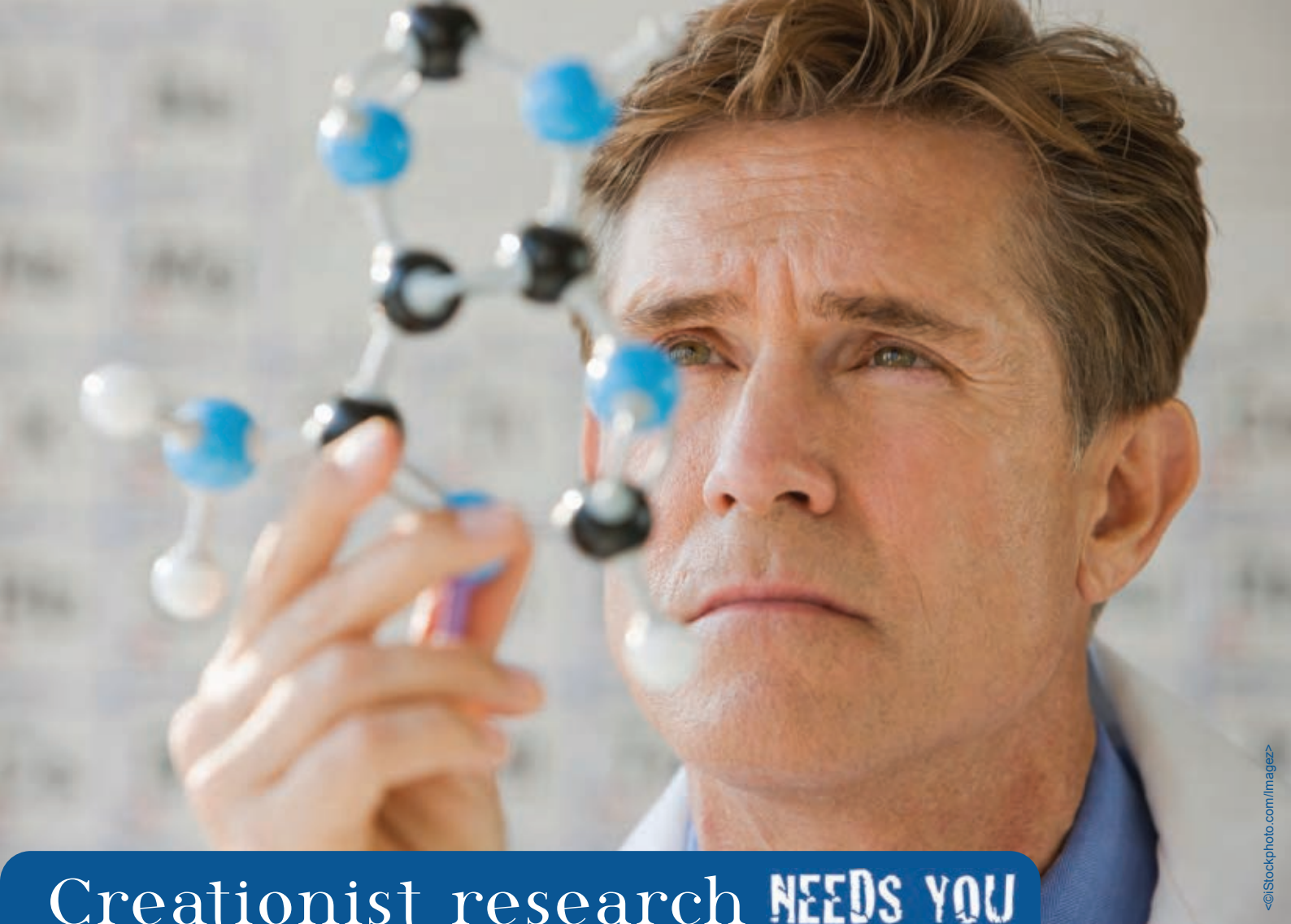
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